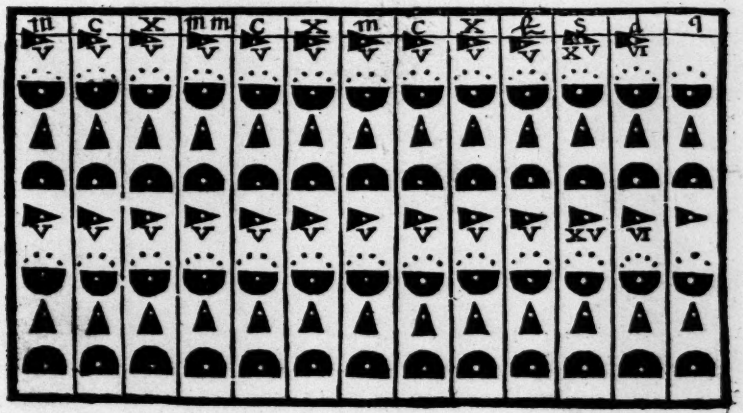
THE IEWELL OF ARITH-METICK:

OR,

THE EXPLANATION OF A NEW INVENTED ARITHMETICALL TABLE, WHOSE portraiture is here demonstrated.

PLEASANT TO READE, AND PROFITABLE to be practised by all degrees of men, at all times, and in all places.

Written by I. H. *Gentleman, and published by his Maiesties Priuiledge vnder the Broad Seale.*



LONDON,
Imprinted by *Felix Kyngston:* and are to be sold by *Iohn Browne* at his shop, vnder Saint Dunstons Church in Fleetestreete. 1617.

TO MY MOST HONOVRED AND WORTHY FAVOVRER OF ALL VERTVES, SIR THOMAS SMITH, Knight, Gouernour of the Worſhipfull Company of Merchants trading the *East Indies*; alſo of the *Muſcouie* and *French* Companies; with the Companie of Diſcouerers for the *North-West Paſſage*; and Treaſurer for the Plantation in *Virginia*.

WOrthie Sir, neither to inſinuate by flatterie, nor encroch for reward (things too vſuall in many Dedications), doe I dedicate theſe my labours vnto you; for I know your wiſedome and worth ſufficient to preuent both, if my honeſtie ſhould giue way to either: but to giue notice to the world of the excellencie of the work, by the excellencie of his Protector; and to ioyne a matchleſſe Patterne, to a matchleſſe Patrone, knowing the great and waightie affaires, that are daily managed by your iudgement and direction; and chooſing rather to march vnder the Banner of Wiſedome, then Greatneſſe, I can finde none more worthie this gift, nor no

gift more worthie your acceptance. May it therefore pleaſe you, to let it paſſe vnder the ſeale of your iudgement, as a ſufficient Antidot, to preuent the poyſon of ignorant cenſurers, the worth being duly conſidered by your worthie ſelf; I ſhall be happie in my labors, and you bee aſſured of a man readie to vndertake a farre greater taske to deſerue your fauour, whenſoeuer you pleaſe to commaund me: ſo praying for your good and happie ſucceſſe in all your noble and vertuous enterpriſes,

I reſt

Yours

Humbly,

Io. HARPVR.

THE EPISTLE TO THE READER.

ONely Diuinitie excepted, there is no Science in the whole world that doth more increaſe the knowlede, or inrich the mind of man, then Arithmetick, it being (as it were) the dore or entrance into all other liberall Sciences, or worthie Arts whatſoeuer; and being entered, doth fauourably leade the ingenious and conſtant Practicioners from Science to Science, from Arte to Arte, from knowledge to knowledge, till he attaine ſuch a meaſure of perfection, that he may both honour and glorifie his Creator, by the ſight and knowledge of his wonderfull workes; doe good and acceptable ſeruice to his Prince and Countrie, and alſo goe through his owne affaires, with greater eaſe and facillitie, of what function or calling ſoeuer he be. Since then Arithmetick in it ſelfe is knowne to be thus excellent, for her ſpeedie and eaſie direction into other Sciences, doubtleſſe the Table (of which this Booke intreateth) cannot but be acceptable to all wiſe men, for the ſpeedie and eaſie direction into Arithmetick. But it may bee obiected, that there is no poſition throughout this whole Book, but the pen is able to worke it, as well as the Table. All which I denie not, nor would I in any ſort diſalow the pen-working, but rather admire the manifold excellencies belonging vnto it; onely thus much I may boldly affirme, that there is no queſtion of what nature ſoeuer, within the compaſſe of the whole Arte of Arithmetick that the Pen is able to worke, but the Table hath abilitie to effect the ſame, in leſſe time, and with more facilitie, both by reaſon of the eaſie breaking of figures

into parts, and the wonderfull congruitie of those parts answering one another. Neither is the Pen or Table the lesse to be esteemed, because each of them can effect one and the same operations, no more then the Vyoll is to be contemned, because the verie same lessons may be plaied vpon the Lute; therefore he is most praise-worthie that is excellent in both, because the Table is necessarie to be alwaies about him abroad, and the pen is alwaies readie in his Studie, or Chamber at home; and being together, they are an excellent proofe each of other. And thus much haue I written, to giue heart and courage to him that shall vndertake the study of this science, either by the Pen or Table: for it is a thing too vsuall among vulgar iudgements, to be timorous and fearefull of vndertaking any thing, wherein there is any shew of difficultie; by which feare they are much hindred and abused, making them thinke those things hard and difficult, that indeed are most easie and perspicuous. When on the contrary, men of vnderstanding will the sooner vndertake them, knowing, that the more difficult they are, the more honour in obtaining them; and the studie of knowledge in any honest kinde, doth giue much contentment euen in his hardnesse: but being knowne, the easinesse of those things that before seemed hard, doth giue an extraordinarie recreation to the spirits, whereby we goe through those seeming hard things with ease, delightfulnesse, and pleasure. Therefore let no man bee discouraged in the search of knowledge, considering his knowledge cannot bee so little, but he must needs know those things are knowne to others: and if to others, why not to himselfe? onely because hee will not seeke them; let him seeke them then, and they are his as well as others.

To conclude, whosoeuer hath this Table, and knoweth how to vse it, hath indeed an Arithmeticall Iewell, affording more varieties of workings, then the most cunning Artist in the world is able to comprehend: seeing that nothing can come within

within the compaſſe of any Artiſts inuention, but the Table doth preſently offer it ſelf for the triall of his concluſion; and in as many varieties as his inuention can turne too, for the approbation of all the prety and pleaſing concluſions Arithmeticall.

But becauſe I will not bee tedious in the commendation of that, which no inuention of man is able to confute; I leaue it to the approbation of it ſelfe, in the conſideration of the Artiſt, wiſhing to all as much profit by the vſe of it, as it ſelfe hath ſufficiencie in the working: ſo I reſt

Your loning friend

I. H.

A LETTER SENT FROM A DIVINE to the Author, concerning his Booke, and Table.

GOod Sir, I haue peruſed your Booke and Table, and by the working of ſome Rules, I doe eaſily conceiue of the reſt; truly I doe thinke it both for the excellencie in it ſelfe, and for the moſt neceſſarie vſe to be very worthy and fit to bee publiſhed: the Mathematickes in generall ſeeme to be grounded vpon this one principle, *that God hath framed his workes in number, in weight and in meaſure*, and therefore no creature can perfectly be knowne without the due conſideration hereof. They are likewiſe moſt agreeable to mans preſent ſtate and condition, as being grounded in the matter, which is the obiect of ſenſe, and yet conſiſting of imaginarie abſtractions, wherein the vnderſtanding, and reaſon takes place: ſo that indeed they are neither meerely ſpeculatiue, which might rather beſeeme Angels then men; nor meerely practicall, which were to be drowned in ſenſe; but conſiſt in a mixture and mediocritie betweene both. And therfore are of the greateſt certaintie, wherein both reaſon and ſenſe doe ioyne together in the obſeruation of truth; and of the greateſt vſe, as being anſwerable to the two ſeuerall parts and faculties of man: and being thus both vſefull and demonſtratiue, no Arte can better diſcouer the Wiſdome, Prouidence, and Architecture of God in the frame of his workes, then the vſe of the Mathematicks.

To deſcend to Arithmeticke, me thinks I ſee an excellent type or myſterie, ſome kinde of reſemblance betweene God and the creatures; all numbers proceede from an vnitie, which ſeemes to point out the firſt Mouer, who is the ſole efficient cauſe of the creatures: this vnitie may infinitely extend it ſelfe, and be infinitely diuided in fractions, which argues the vnlimited power of God, who can create many infinite worlds; who can inlarge and increaſe the creatures, or abate and leſſen their vigour and ſtrength; take away the vnites, and there will remaine ciphers, which ciphers being added or multiplied together, yet ſtill can produce nothing but ciphers. And thus it

is

is with the creatures in reſpect of themſelues, who neither can giue, alter, or change their owne nature and being. The generall vſe of Arithemetick appeares in all Artes and Sciences, as Theologie, Cronologie, Aſtrologie, Coſmographie, and the reſt: inſomuch that ſome haue compacted Philoſophie onely conſiſting of numbers; and euen the counterfeit and vnlawfull Artes, vſe numbers and characters, as a pretext for their truth.

Leauing Arithmetick, I come to your Table: it is an excellent obſeruation of a moſt honourable and learned Gentleman, in his Aduancement of learning, that Sciences haue been too ſoone reduced into methods and formes; and that Students contenting themſelues with thoſe formes, haue indeede ſtaied the proficiencie of learning, which otherwiſe would further haue propagated it ſelfe. And thus it falleth out in Arithmetick, while ſome with their Pen, ſome with their Counters haue practiſed; vntill this time, the working by Tables was neuer inuented, which notwithſtanding is performed with farre greater eaſe and facilitie: for here is no blotting, or blurring, no changing of places, no ſuperfluous additions, no miſtaking or miſplacing of figures: it is learnt with great eaſe, practiſed with great expedition, and ſetting the numbers before vs, not preſuming ſo much vpon the weakeneſſe of our memorie, it is wrought with farre greater certaintie (I meane not in reſpect of the Art, but the Artiſt); things may ſeeme ſtrange at the firſt, but after due triall, I doubt not, but it will tend to the great profit of young Students, to the neceſſary vſe of Merchants and Tradeſmen, and to your owne great commendation, that haue deſerued ſo well of the Science:

Thus deſiring you not to conceale an inuention
of ſuch worth, beſeeching God to giue
you all happy ſucceſſe in your
labours, I reſt

Your very louing friend

G. G.

To his worthy friend, Mr. Io. Harpur.

WEll hath thy labor thrise diſtreſſe first ſeene,
Th'vnpaſſable bridge, that ten leg'd paſſe hated,
When I vnſinga ſhe came with hungrie mane
From Cuccere, and hogg'd them would'ſt afford
Thy helpe to him: for ſure he was t'was ſomething;
Yet could not I eſteem t'above a Pumkin.

But ſince, I ſay, by thy enduſtrious paines,
Th'haſt made me ſee and vnderſtand my error;
For by thy goodneſſe all men reapeth gaines,
Thy worke and thee may well be term'd a Mirror:
Wherein's this leſſon, worthy all mens fauour,
The fruit of praiſe growes on the tree of labour.

I. C. to the Reader.

IF one ſhould poure into thy cheſt a treaſure,
Or adde to knowledge, what was hid till then:
He that deuiſes due praiſes in ſome meaſure,
Neglects the dutie of all honeſt men.

How ſhall we duly praiſe his worth, that thus
Adds knowledge to the world, not onely we
Reape good, but all? O then let all of vs
(Praiſe worthie firſt) praiſe him that bleſſeth thee:
Vertuous friend, thou add'ſt to vertue fewell.
Receiue our thanks and praiſe, as we thy Iewell.

THE

THE IEWEL OF ARITHMETICK.

Of Numeration.

NVmeration, or Numbring, is the entrance into Arithmetick, as being neceſſarie to be knowne, before we begin to learne the Arte it ſelfe, both by reaſon of the eaſineſſe, and the generall vſe made of it, in all the Arts depending vpon Arithmetick: of his eaſineſſe, as being knowne to all, for who is ſo ſimple, that he cannot reckon 1.2.3.4.5.6.7.8.9. Of his vſe, becauſe none of the Arts can be wrought without the vſe of numbring; for both in Addition, Subtraction, Multiplication, and Diuiſion, we can neither nominate our Totall, our Remaines, our Product, nor our Quotient, without Numeration. So that you perceiue, though Numeration bee none of the foure branches of Arithmetick, yet is it, and ought to be, a ready wayter, and certaine diſtributer of their operations, according to the trueneſſe of our working: thus much for the dependance vpon others. Now for Numeration it ſelfe, it is vſually diſtinguiſhed in three kindes, that is to ſay, Digit, Article, and Compound: of Digit numbers there are onely 9. *viz.* 1.2.3.4.5.6.7.8.9. Article, is any number, that hath one or more Cyphers following it, as 10.20.30. 100.2000. &c. of this kind, we may reckon the tenth part of all numbers; for if we begin at one, and increaſe by one, to infinite, we ſhall find euery tenth to be an Article number.

Compound, are numbers mixt of Articles and a Digit, as 11.12.26.47.139. and so forth of all others, of this kind, wee may allow 9. tenth parts of all numbers wanting but 9. which are Digits. Now in euery number Compound, there is onely one Digit which holdeth the last place, and all the rest are Articles; for considering that euery tenth number, is an Article, and that euery place exceedeth his lower place iust ten times; therefore of necessitie euery higher place must bee an Article, and the lowest place, holding a Digit, maketh a Compound number.

Concerning these places, and their increase by ten, obserue this Figure of our Table, where you see each parallel to demonstrate a seuerall place, and each place plainely demonstrated.

m. Mi. Millions	c. C. Millions	x. Ten Millions	m. A Million	C. C. Thousand	x. Ten Thousand	m. A Thousand	C. An Hundred	x. Tennes	li. Pounds	s. Shillings	d. Pence
0	9	8	7	6	5	4	3	2	1		

Of Addition.

ARithmetick is a Science depending vpon foure Principles or maine branches, that is to say, Addition, Subtraction, Multiplication, and Diuision. Who, or whatsoeuer is capable of these foure, is likewise capable of the meanes whereby to worke all the questions, to be wrought by Arithmetick, of what nature soeuer. But this Table, of which we intreate, is capable of these foure; and that in so excellent a manner, as we may (with modestie enough) maintaine, that there is no Artist in the whole world, able to propound that question, but this Table is capable of the worke, if hee know the rule whereby to worke

worke it, thus much for the neceſſarie vſe of it. Now that you may know how to vſe it, we will giue you Examples with their inſtructions, both of theſe foure, and many other right neceſſarie rules depending vpon them. And firſt of Addition, which is an orderly Adding, or gathering together of many Summes, or parcels into one Totall, as if we had 769. 437. and 279. of which three, wee would know the totall, we may (if we will) place them in three rowes of our Table thus, and then beginning at the greateſt, next our left hand, wee reckon 2 and 4 is 6, and 7 is 13, being in the place of Hundreds, wee leaue 3, in the ſame place, and ſet 1. in his higher place, that is, in the place of thouſands, ſo it ſtandeth 1300: then we come to the next place, where wee reckon, 7 and 3 is 10, and 6 is 16, we leaue the 6 vncancelled, and ſet 1. for the 10, a place higher, ſo our ſumme ſtandeth 1460: then wee come to the third and laſt place, and beginning at the loweſt, we reckon vpward, 9 and 7 is 16, and 9 is 25, we leaue 5 in the ſame place, and ſet 2 for 20 in the higher place, ſo our whole Totall is 1485, as in the example. But when wee finde many ſummes to be added together, wee onely lay the Table before vs, right ouer the figures, or ſummes to bee added, and then beginning at the higheſt place, next our left hand, and the loweſt figure in the ſame place, wee reckon vp to the higheſt, and the number amounting, wee ſet accordingly in one row, and the ſame place of our Table; and then falling to the next place, what ſumme amounteth, wee infuſe into the former, ſo that wee neuer charge our memorie with the carriage of any thing: and this briefly is the methode of Addition by our Table. But becauſe example is the beſt inſtruction, we will produce examples, whereby our Scholler may bee fully inſtructed in our Tables working.

m.	c.	x.	li.	s.	d.
1	4	8	5		
	7	6	9		
	4	3	7		
	2	7	9		

Firſt let vs ſuppoſe, that we had theſe ſummes to receiue or pay, which we find ſet downe in this order, and deſire to know the Totall, we therefore take our Table, and placing it right ouer our ſummes, we begin at the higheſt figure 2, conſidering it

in the ſixth place, ſo we ſet 2 in the ſixth place of our Table, that is, in the place of C. thouſands, ſo our ſumme ſtandeth 200000: then come wee to the next place, where we find 8 and 7, making 15, which we are to ſet in the ſame place of our Table; but becauſe no place can beare aboue 9, wee ſhere-fore open 5 in the ſame place, and 1 in his higher place, ſo our ſumme ſtandeth 350000: then wee come to the third place, and there we find 7, 6, and 3, in all 16, we open 6 in the ſame place, and 1 in his higher place, ſo haue we in all 366000: againe, we come to the fourth place, where we find 6, 4, 5, and 6, in all 21, we open 1 in the ſame place, and 2 in his higher place, our ſumme then ſtandeth 368100: then to the fifth place, where we finde 9, 5, 3, 2, and 5, in all 24, we open 4 in the ſame place, and 2 aboue him as before, ſo our ſumme is 368340: now to the ſixth and laſt, being the place of Vnities, where we find 7, 6, 2, 5, 9, and 4, in all 33, wee ſet 3 in the ſame place, and 3 in his higher place, ſo the totall of our Addition ſtandeth 368373, as in the example.

368373				
273654				
86329				
7435				
652				
96				
7				

li.	s.	p.		
2369	10	06	1/2	
0763	09	05	1/2	1/4
0133	07	04		1/4
0033	02	03		
0024	11	09		
0019	02	07	1/2	
0027	12	03		1/4
0142	01	07		
0026	02	06		
0013	09	07		1/4
0014	03	02	1/2	
0010	16	01		1/4
0006	04	06	1/2	
3583	13	09	1/2	1/4

If we were to adde theſe ſummes together, we may (if we will) lay our Table either aboue, or beneath, and worke as in the former example: but for varietie wee will now begin where the pen beginneth, whereby our Scholer may perceiue, that wee can follow the pen, according to it owne working, though the pen can not by any meanes follow our Table; we therefore place our Table, and begin with farthings, of which we find 5, that is 1 d. 1/4, we ſet 1 d. 1/4, and reckon our halfe pence, which are alſo 5, that is 2 d. 1/2, we ſet 2 d. 1/2 ſo haue we 3 d. 1/2 1/4, then we reckon our pence, and we find 66, that is 5 s. 6 d. we ſet 5 s. 6 d. ſo haue we 5 s. 9 d. 1/2 1/4: then to our ſhillings, which we find to be 48, that is 2 li. 8 s. 0 d. this

we ſet to the former, and it maketh 2 li. 13 s. 9 d. $\frac{1}{2}$ $\frac{1}{4}$: now to the tens of ſhillings, where we find 4, that is 2 li. which added to the former, maketh 4 li. 13 s. 9 d. $\frac{1}{2}$ $\frac{1}{4}$: this done, we come to the Vnities of pounds, which we reckon and find to be 59, we cancell 1 of the other 4, and ſet 60, and then our ſumme is 63 li. 13 s. 9 d. $\frac{1}{2}$ $\frac{1}{4}$: againe, wee reckon all in the place of tens, and find 32, we ſet 2 in the ſame place, and 3 a place higher, our ſumme then ſtandeth 383 li. 13 s. 9 d. $\frac{1}{2}$ $\frac{1}{4}$: then wee come to the place of hundreds, where we find 12, we ſet 2 in the ſame ſpace, (with 3 there already making 5), and one in his higher place, and our ſumme is 1583 li. 13 s. 9 d. $\frac{1}{2}$ $\frac{1}{4}$: ſo to our fourth and laſt place, where wee finde onely 2, wee ſet 2 in the fourth place of our Table, and our totall ſumme will be 3583 li. 13 s. 9 d. $\frac{1}{2}$ $\frac{1}{4}$. Hereby appeareth, that we can worke with the pen, and contrary to the pen, and yet in both theſe waies we can free our memorie from the carriage of any burthen whatſoeuer.

When our ſummes ſtand in letters, as in this example, wee doe then vſe our Table in the nature of Compters, by laying the edge of our Table euen with the vppermoſt ſumme of 569 li. 13 s. 4 d. which we ſet in the vpper row of our Table, and then drawing it lower, wee diſcouer our ſecond ſumme of 243 li. 7 s. 6 d. $\frac{1}{2}$, this we adde into the former, and our Totall is 813 li. 0 s. 10 d. $\frac{1}{2}$: likewiſe we diſcouer our third ſumme, being 58 li. 11 s. 9 d. $\frac{1}{4}$, we adde this into our totall, it maketh 871 li. 12 s. 7 d. $\frac{1}{2}$ $\frac{1}{4}$: againe, wee diſcouer our fourth ſumme, being 78 li. 19 s. 3 d. $\frac{1}{2}$ $\frac{1}{4}$, which added into our former totall, maketh 950 li. 11 s. 11 d. $\frac{1}{2}$: Laſtly, we adde our fifth and laſt ſumme, being 49 li. 8 s. 0 d. $\frac{1}{2}$, we adde 49 li. 8 s. ſo haue we 999 li. 19 s. 11 d. $\frac{1}{2}$: laſtly, wee adde a halfe-penny, which with the other halfe-penny, maketh a penny, that penny and 11 d. maketh 1 s., and 19 s. maketh 1 li., 1 li. and 9 li. maketh 10 li., 10 li. and 90 li. maketh 100 li., 100 li. and 900 li.

c.	li.	s.	d.	
v.	lxix.	xiij.	iiij.	
	li.	s.	d.	
cc.	xliij.	vij.	vj.	ob.
	li.	s.	d.	
lviij.	xj.	ix.	qu.	
	li.	s.	d.	
lxxviij.	xix.	iij.	ob.	qu.
	li.	s.		
xlix.	viij.	ob.		

900 li. maketh 1000 li. So that you perceiue, when these ſummes are added together, their Totall amounteth to iuſt 1000 li. And in this manner may you adde them together, how many ſoeuer, or whatſoeuer they were, ſo that you ſee, our Table is capable to worke, both according to the pen and compters; whereupon we conclude, that whoſoeuer hath this Table, hath at any time pen, inck, paper and compters for his owne ſatisfaction in any reckoning, or the working of any queſtion Arithmeticall, if his owne knowledge be not wanting in the vſe of it: and thus wee conclude our firſt branch called Addition.

Of Subtraction.

SVbtraction is an orderly withdrawing, or rebating one ſumme or number out of another; many out of one, or many out of many. And this worke of Subtraction, though it be one of the eaſieſt by the pen, yet we hold it to be ſomewhat more eaſie by the Table, by reaſon that (the ordinarie inforcement of Subtraction allowed, that is alwaies to ſubtract a leſſer out of a greater) there can no ſumme or number bee ſo ſet downe, but we alwaies haue a greater figure to ſubtract a leſſer from, and in ſuch ſort that we neuer burthen our memorie with the carriage of any thing, as you ſhall perceiue by our order of working in three or foure plaine examples. If a Noblemans Receiuer haue taken vp Rents of his Lords, to the value of 7964 li. and haue paied back at ſeuerall payments 6543 li. the queſtion is, what remaineth in his cuſtody: to worke this or the like, we ſet our Receit in the firſt row, our payment in the ſecond of our Table, as in this example, then wee begin at the higheſt place, next our left hand, where we haue 6, with 7 ouer it, we cancell or ecthlipſe 6 of that 7, there reſt 1 in the place of thouſands:

c.	x.	m.	c.	x.	li.	s.	d.
		1	4	2	1		
		7	9	6	4		
		6	5	4	3		

thouſands, then we deſcend to the next place, where wee finde 5 and 9 ouer it, wee Cancell 5 of that 9, remaineth 4 in the place of Hondreds. Againe, we come to the third place, where we haue 4, and 6 ouer it, wee cancell 4 of that 6, reſt 2 in the place of tens. Laſtly, to the place of Vnities, where finding 3 and 4 ouer it, we cancell 3 of that 4, remaineth 1 in the ſame place, ſo our remaines is 1421 li., as in the example, ſo much hath the Receiuer ſtill in his cuſtodie. And this eaſie queſtion we propounded, that our Scholler might with more eaſe perceiue the order and methode of our Tables working.

Imagine that we haue receiued, or borowed 2647 li. of which we haue paied back againe 1978 li. the queſtion is, what remaineth; for the ſolution of which, we place our numbers in our table thus, then beginning at the higheſt place, wee finde 1 to bee ſubtracted from 2, wee cancell 1 of the ſame 2, ſo haue we 1, in the place of thouſands; then we come to the next place, where we find 9, and but 6 ouer it, ſo that we cannot cancell 9, where there is but 6, wee therefore cancell the Vnitie, that we left in the higher place, ſaying, 9 out of 10, reſts 1, which 1 we open in the ſame place, making our 6 to be 7, whereby wee haue 0 left in the place of thouſands, and 7 in the place of hundreds: wee come to the third place, where we haue 7, with 4 ouer it, we againe cancell one of his higher place, ſaying as before, 7 out of 10 reſt 3, which 3 opened in the ſame place, with the 4 already there, maketh 7, ſo haue we 0 in the firſt, 6 in the ſecond, and 7 in the third place: we come to the laſt place, where wee find 8, and but 7 ouer it, we therefore cancell 1 in his higher place, ſaying, 8 out of 10, reſt 2, which 2 opened in the ſame place, maketh the ſame 7 to be 9, and now haue we 0, 6, 7, 9, in our 4 places, whereby we know, that if we haue borowed 2647 li., and paied backe againe

mi.	c.	x.	m.	c.	x.	li.	s.	d.
				6	6	9		
			2	6	4	7		
			1	9	7	8		

gaine 1978 li., we are ſtill indebted 669 li., as appeareth by the example.

If I haue receiued for the vſe of my Lord or Maſter at one paiment, 3569 li. 13 s. 4 d.; at another payment, 11375 li. 9 s. 9 d., and haue deliuered backe againe two ſeuerall accounts, the one amounting to 4894 li. 7 s. 4 d., and the other to 3978 li. 9 s. 10 d. $\frac{1}{2}$ $\frac{1}{4}$, the queſtion is, for what I am ſtill accomptable. To worke this or ſuch like ſet the 2 ſummes receiued in the firſt and ſecond row; and the two ſummes paied, in the third and fourth rowes, as in this example; then adde the firſt and ſecond together, and they make 14945 li. 3 s. 1 d. for the totall of your receites:

mi.	c.	x.	m.	c.	x.	li.	s.	d.	
			3	5	6	9	13	4	
		1	1	3	7	5	9	9	
			4	8	9	4	7	4	
			3	9	7	8	9	10	$\frac{1}{2}$ $\frac{1}{4}$

then for the ſecod worke, ad your third and fourth numbers together, ſo haue you 8872 li. 17 s. 2 d. $\frac{1}{2}$ $\frac{1}{4}$, for the total of al your payments, and then will your two ſums ſtand in your Table thus. Now if you ſubtract the leſſer out of the greater, as you are taught in the former example, you will find the remaines to be 6072 li. 5 s. 10 d. $\frac{1}{2}$ $\frac{1}{4}$, for ſo much am I ſtill accomptable, as the example manifeſteth.

mi.	c.	x.	m.	c.	x.	li.	s.	d.	
		1	4	9	4	5	3	1	
			6	0	7	2	5	10	$\frac{1}{4}$
			8	8	7	2	17	2	$\frac{1}{2}$ $\frac{1}{4}$

A Marchant beyond the Seaes, is indebted to one man 2534 li.

2534 li. 6 s. 8 d., to another Creditor 769 li. 8 s. 9 d., and to my ſelf 3154 li. 3 s. 2 d. $\frac{1}{4}$; and hath ſent directions by letters to me, where I ſhall receiue for him, 4975 li. 13 s. 4 d., deſiring me to ſatisfie the other two Creditors, and the reſidue of the money, to take in part of paiment of mine owne debt; the queſtion is how much is payed, and how much more is due vnto me. To worke this the neereſt way, I ſet in the vpper row of my Table, mine owne debt; and I ſet it firſt, becauſe it is laſt to be paied, and that in order, I may make my laſt Subtraction from it, of the remaines of the ſum receiued, when the other 2 Creditors are paied. Therfore my own debt, being 3154 li. 3 s. 2 d. $\frac{1}{4}$, ſtandeth in the firſt row, in the ſecond row I ſet the ſum receiued, which is 4975 li. 13 s. 4 d; In the third row, I gather the two Creditors into one Totall, and they make 3303 li. 15 s. 5 d. And now my ſummes ſtand in order, as in the example: for I am to ſubtract the loweſt out of the ſecond, & the remaines of the ſecond out of the firſt, therfore I begin my worke, and ſubtract 3303 li. 15 s. 5 d. from 4975 li. 13 s. 4 d., there remaineth 1671 li. 17 s. 11 d; Againe, I ſubtract the ſame 1671 li. 17 s. 11 d., ſtanding in the ſecond row of my Table, from 3154 li. 3 s. 2 d. $\frac{1}{4}$, ſtanding in the firſt row, and the remaines are 1482 li. 5 s. 3 d. $\frac{1}{4}$: ſo the third row ſhewes me, that I haue paied to the other two Creditors, 3303 li. 15 s. 5 d.; the ſecond row ſhewes me, that I haue receiued 1671 li. 17 s. 11 d. in part of mine owne debt; and the firſt row ſhewes mee, that there is ſtill due vnto me 1482 li. 5 s. 3 d. $\frac{1}{4}$, which is the queſtion deſired: for proofe of this, adde the ſecond ſumme to the

mi.	c.	x.	m.	c.	x.	li.	s.	d.	
			3	1	5	4	3	2	$\frac{1}{4}$
			1	4	8	2	5	3	
			4	9	7	5	13	4	
			1	6	7	1	17	11	
			3	3	0	3	15	5	

vppermoſt, and it maketh the firſt ſumme; then adde the third to the ſecond, and it maketh the ſecond ſumme; Laſtly, ſubtract any of the Creditors from the totall of them both, and the remaines will ſhew the other Creditor, whereby you may bee aſſured, that you haue euery way truly wrought it.

The next queſtion is, that I am indebted to a Marchant beyond the Seas 3779 li. 16 s. 8 d., and hee writeth to mee, that himſelfe is indebted to three ſeuerall Creditors; to the firſt 1463 li. 14 s. 3 d., to the ſecond 732 li. 8 s. 4 d., and to the third 259 li. 17 s. 9 d.; which three he deſireth me to ſatisfie out of the money due vnto him, and withall to diſburſe for him in certaine commodities, 2550 li.: the queſtion is, after the paiment of theſe debts, what is due vnto him; and after the diſburſing of this money, what is due vnto me. To worke this, we ſet the ſumme to be diſburſed in the vpper row of our Table, which is 2550 li.; in the ſecond row we ſet our own debt, being 3779 li. 16 s. 8 d.; in the third row, wee gather our three Creditors into one totall, and they make 2456 li. 00 s. 4 d., and then our thre numbers ſtandeth in our Table thus:

then wee	mi.	c.	x.	m.	c.	x.	l.	s.	d.
begin our				2	5	5	0		
work (as									
we haue				3	7	7	9	16	8
formerly									
taught)				2	4	5	6	0	4
at the									
loweſt,									
and ſub-									
tract it									
out of									

the ſecond, the remaines are 1323 li. 16 s. 4 d. Againe, we ſubtract the ſame remaines out of the vppermoſt, and his remaines are 1226 li. 3 s. 8 d.; ſo the anſwer is, when we haue paied thoſe three Creditors, there is ſtill due vnto him from vs 1323 li. 16 s. 4 d.: but when wee haue laied out for him 2550 li., there is due vnto vs, from him 1226 li. 3 s. 8 d.; for

proofe

proose of this, adde the second to the first, and the third to the second, as in the former example, and you produce your three summes in order as they were at the beginning. And this may suffise for the worke of Subtraction.

Of Multiplication.

MVltiplication is an Art of Arithmetick, defined by the antient wise men to bee none other, then a briefe working of many Additions. And that it is so, appeareth by reason, experience, and truth: for if we multiply 140 by 44, our product will be 6160: so likewise if we set 140, 44 times, or 44, 140 times, the additions of all these together, would make 6160, as before: but this last were a difficult and a tedious work, indeed enough to ouercharge the memory of a very good Artist; therfore those wise men haue deuised this work of Multiplication, whereby at one onely working, and without any charge to the memorie (saue only a little obseruation of right placing our figures) we may answer, and truly answer, either the same, or any other question in the same nature. But you must vnderstand, that whē we speak of freeing the mind from any such burthen, we intend by the work of our Table; because the pen cannot do it, but must be constrained to carry from one place to another, much more in this worke of Multiplication, then in the former worke of Subtraction. And with much more difficultie, by reason that we are many times forced, to carrie 7, 8, or 9 in our minde, to a higher place; and when we come there, we often find 9 to bee multiplied by 8, or 8 by 7, or the like, which if we be not very perfect in our Table of Multiplication, it wil be some difficulty, to find what 8 times 9 is; and when we haue found it, we are in some danger of loosing what wee brought with vs, so that both waies we may worke falsely; for the auoiding of which, let our scholler make himselfe perfect in the Table of Multiplication, and our Table will free his memorie from any burthen whatsoeuer, as you shall perceiue by our examples.

And first of Duplation, or multiplying by 2; if 1647 were giuen to be doubled, we set the same 1647 in any row of our

Table, and begin at the higheſt figure, next our left hand, ſaying 2 times 1 is 2, we make the ſame 1, 2, and haue done with our firſt figure, and now is our Multiplicand ——— 2647

We point to the next place, and reckon, 2 times 6 is 12, we cancell 4 of the ſame 6, leauing 2 in the ſame place, and ſet 1 in the higher place, ſo haue we in all ——— 3247

We come to the third place, and reckon, 2 times 4 is 8, wee open 8 in the ſame place, and then haue we ——— 3287

So to our fourth and laſt place, ſaying, 2 times 7 is 14, wee leaue 4 in the ſame place, and ſet 1 in the higher place, ſo our whole product is, ——— 3294

Thus you ſee, that our worke is quite contrarie to the pen, for we alwaies begin at the higheſt place, and we neuer charge our memory with any thing.

If we were to multiply the ſame product, 3294 by 3, we ſet the ſame number in any row of our Table, and pointing (as before) to our higheſt figure, we reckon 3 times 3 is 9, we open 9 in the ſame place, and haue done with him, ſo haue we 9294

Then we point to the next place, and reckon 3 times 2 is 6, we open 6 in the ſame place, and then haue we ——— 9694.

So we fall to the third place, and reckon 3 times 9 is 27, we leaue 7 in the ſame place, and for 20 wee ſet 2 in the higher place, and now haue wee ——— 9874

Laſtly, we point to the laſt place, reckoning 3 times 4 is 12, we leaue 2 in the ſame place, and ſet one in the higher place, and then our whole product is ——— 9882

And according to this methode, doe wee worke any multiplication by any Digit from 2 to 9, (for one doth neither multiply nor diuide): if we are to multiplie by 10, we only remoue our multiplicand a place higher; as, if we were to multiplie 12 by 10, wee ſet 12 a place higher in our Table, and it ſtandeth 120: ſo if we multiplie it by 100, we remoue it two places higher, and it ſtandeth 1200: likewiſe by 1000, three places higher, and ſo forth of all other; for as many Cyphers as follow the Vnite, ſo many places higher remoue your multiplicand, and by the ſame number it is multiplied. But when one, or more Cyphers follow any other figure, then a vnite, wee remoue our multiplicand ſo many places higher, and multiply by

the

the ſame figure; as, if wee were to multiplie by 20, wee ſet our number a place higher, and multiplie by 2; likewiſe by 30, remoue it a place higher, and multiply by 3; by 400, remoue it two places higher, and multiply by 4; by 7, 8, or 9 thouſand, remoue it 3 places higher, and multiply by 7. 8, or 9, and ſo of any other, for example, we are to multiply 345 by 70, we ſet our multiplicand a place higher, whereby it ſtandeth ——— 3450

Then we point to our firſt figure in the place of thouſands, and there reckon 7 times 3 is 21; we ſet 2 in the higher place for 20, and 1 in the ſame place, ſo haue we ——— 21450

We come to the next place, and reckon 7 times 4 is 28; wee againe ſet 2 in the higher place for 20, and 8 in the ſame place, and then haue wee ——— 23850

We come to our laſt place, which now is the place of tens, and there wee reckon 7 times 5 is 35, wee leaue the ſame 5 ſtanding, and ſet 3 in his higher place, where we already find 8, wee cancell 7 of the ſame 8, making the ſame 3, 10, and ſet one in his higher place, and our whole product then ſtandeth ——— 24150

By which example you may both perceiue how to multiply by a Digit, and alſo, how to diſpoſe of it, when one or many Cyphers follow your digit. And the like worke ſerueth, as well in many figures, as in one onely, of which we wil giue you inſtance, in the next example; ſuppoſe that 529, were giuen to be multiplied by 16, we ſet our giuen number in the firſt or ſecond row of our Table, and our multiplier in the next row beneath it, ſo that it may ſtand proportionable to the higheſt figure of our multiplicand, as you ſee in this example. Then we point to the place where the firſt figure of our multiplier ſtandeth, and we reckon once 5, is 5, wee ſet 5 in the ſame place, and haue done

	m.	c.	x.	m.	c.	x.	l.	s.	d.	
				5						
				0	5	2	9			
				1	6					

done with him, we fall to the place where our 6 ſtandeth, and reckon 6 times 5 is 30, we cancell the 5, and for 30, we ſet 3 in the higher place; ſo haue we in the row of our multiplicand 8029, as

m.	c.	x.	m.	c.	x.	li.	s.	d.
				2				
			8	0	2	9		
				1	6			

in this example: wee remoue our multiplier a place lower, ſetting it as you ſee, in the ſame proportion, to our ſecond figure, that we did to our firſt, and pointing to the higher place, wee reckon once 2 is 2, we ſet 2 in the ſame place, and fall to the place where our 6 ſtandeth, there reckoning 6 times 2 is 12, we leaue the ſame 2 for 2, and ſet one in the higher place for 10, ſo haue wee 8329 in the row of our Multiplicand; wee againe remoue our multiplier lower, as in this example, and pointing to the firſt place, we reckon, once 9 is 9, which 9 we are to ſet in the ſame place, but wee there find 2 already, we therfore cancell one of the ſame 2, making the ſame 9—10, for which 10, we ſet one in his higher place, and haue done with him; we deſcend to the laſt place, and reckon 6 times 9 is 54, we cancell 5 of the ſame 9, leauing but 4, and for 50, we ſet 5 in the higher place; ſo our whole product is 8464. and this methode is to be obſerued, how many figures ſoeuer our multiplier bee: likewiſe if a cypher had followed our multiplier, whereby it had been 160, we vſe the ſame worke, and remoue our product a place higher; or wee firſt remoue our multiplicand

m.	c.	x.	m.	c.	x.	li.	s.	d.
			8	3	2	9		
					1	6		

cand a place higher, and worke as before; or wee ſet the laſt figure of our multiplier a place higher, then the firſt figure of our multiplicand, and ſtill cancell away our figure, as it is multiplied, euery way the product would bee 84640. And this may ſerue for a generall and moſt eaſie inſtruction by our Table.

There are many other waies, but this we hold the ſureſt and eaſieſt for a learner, the reſt by a little practice will come vnto him vnlooked for; yet our next queſtion ſhall ſhew a little difference, though in the ſame nature,

If 98 were giuen to bee multiplied by 89, we ſet our multiplicand in the firſt row, and our multiplier in the third row, as in this example, then is our ſecond row ready to receiue our product, and you ſee our figures ſtand proportionable, 89 to the firſt figure of our multiplicand; then wee point to the ſame place in our ſecond row, where the firſt figure of our multiplier ſtandeth, that is in the place of hundreds, and there wee reckon 8 times 9 is 72, we ſet 2 in the ſame place, and 7 for 70 in the higher place; then we fal to the next place, and reckon 9 times 9 is 81, we ſet 1 in the ſame place, and 8 for 80 in his higher place, where we already finde 2, we cancell that 2, making the ſame 8, 10, and ſet one in his higher place, ſo our product is 8010, as in the example: And now haue we wrought the multiplier into the firſt figure of the multiplicand, wee therefore cancell the ſaid 9, and remoue our multiplier a place lower, as in the next example; then (as before) wee point to the place where the firſt figure of our multiplier ſtandeth, and reckon 8 times 8 is 64, wee cancell the 1 in the ſame place, making it 5, and for 60, ſet 6 in the higher place, ſo haue we 8650 for our firſt operation; we come to the laſt place, and reckon 9 times 8 is 72, wee ſet 2 in the ſame place, and 7 for 70 in the higher place,

mi.	c.	x.	m.	c.	x.	li.	s.	d.
					9	8		
			7	2				
			8	0	1	0		
				8	9			

	mi.	c.	x.	m.	c.	x.	li.	s.	d.
place, but we there finde 5, and 7 that we bring maketh 12, wee cancell				8		1	8		
				8	7	2	2		
						8	9		

the same 5, and set 2 in the same place, and one for 10 a place higher; so our whole product standeth 8722, as in the example. And thus haue we as briefly & plainely, as we possibly can, shewed the plaine and easie way of Multiplication by our Table; which by these two examples is plainely demonstrated, and the same order is to be obserued in all questions whatsoeuer.

If the great Turkes Army consist of 2374 Companies, and euery Company 156 persons, the question is, how many men are in his army; set your Multiplier, and Multiplicand, as in this example, and proceede as you are taught, and the product will bee, 370344, as in the example.

	mi.	c.	x.	m.	c.	x.	li.	s.	d.
Multiplicand				2	3	7	4		
Product		3	7	0	3	4	4		
Multiplier		1	5	6					

For the proofe of any Multiplication, diuide the Product by the Multiplier, and the quotient shewes the Multiplicand: or diuide the Product by the Multiplicand, and the quotient shewes the Multipher; which that you may know how to examine, we will now proceede to our fourth and last branch, namely, Diuision.

Of

Of Diuiſion.

Diuiſion is the very ſame to Subtraction, that Multiplication is to Addition: for as Multiplication is none other, then a briefe working of many Additions, ſo Diuiſion is none other, then a briefe working of many Subtractions; each of them working according to an euen proportion: The one vpward, to the manifeſtation of how much, or how many, ſo many times, ſo much, or ſo many, doth amount vnto; the other working downeward, to the manifeſtation of how many times ſuch a ſumme, or number, is contained in ſo much, or ſo many. As if we demand, how many 20 times 20 is by Multiplication, we know it to be 400: So if we demand, how many times 20 is in 400, by Diuiſion wee know it to be 20 times. Likewiſe if we adde 20 times 20 together, we ſhal find it to be 400; and if from 400, we Subtract 20, ſo often as we can, wee ſhall finde, that we may ſubtract it iuſt 20 times. Whereby appeareth, that as the firſt is to the third, ſo the ſecond is to the fourth: that is, as Addition is to Multiplication; ſo Subtraction is to Diuiſion. And yet ſo are theſe foure combined together, that both Addition and Subtraction, and likewiſe Multiplication and Diuiſion ſhall alwaies bee a perfect examination, and a certaine proofe, the one of the other: for although theſe foure doe ſeeme quite contrary or different in their operations, yet doe they together ſtrengthen one another, for the approbation of the certaine truth, that if any one of them were wanting, the whole Arte of Arithmetick, were vtterly maimed and defaced. Seeing then we haue already intreated of Addition, Subtraction and Multiplication, let vs now appropriate our Table, to the true and eaſie working of Diuiſion; which Arte doth alwaies imploy three rowes of our Table: In the firſt we ſet our Diuiſor, or number to diuide by; In the ſecond we ſet our Diuidend, or number to be diuided; In the third, wee ſet our Quotient, or number expreſſing how often our Diuiſor is in our Diuidend. This being duly obſerued, we neuer remoue or cancell our Diuiſor, wee are neuer forced to daſh, or blot out any figure, and ſet another ouer it; wee neuer

faile of rightly placing our quotient, nor we neuer breede any confusion in our worke.

Thus much of the nature, and for the order, now let vs produce examples, first, of diuiding by a Digit or single figure, and so proceede to such questions, as shall be sufficient for the perfect instruction of this Arte, according to the methode of our Table: and first of mediation, taking the halfe, or diuiding by 2.

Example.

A Noble man dying, left vnto his three sonnes 4568 Acres of land, ordering that the eldest should haue the one halfe, and the two youngest the other equally diuided: the question is what each sonnes part shall be: set the Diuisor in the first, and the Diuidend in the second row of the Table, as in this example; then in the third row, point to the place vnder the highest figure,

	mi.	c.	x.	m.	c.	x.	li.	s.	d.
							2		
				4	5	6	8		
1				2					
2				2	2	5	0		
3				2	2	8	0		
4				2	2	8	4		

that is the figure of 4, in the place of thousands, and there reckon, the halfe of 4 is 2, or there is 2 times 2 in 4, set 2 in the same place, so haue you done with your first figure, and your quotient standeth 2000, as in the example: then come to the second figure 5, and there reckon the halfe of 5, is 2 and a half, or there is 2 times 2, and halfe 2 in 5, set 2 in the same place, and for the halfe, set 5 in his lower place, (for if euery Vnit in a higher place, be ten Vnits of a lower place, then 5 of a lower place, must needs be halfe one of a higher place): so hauing set 2 and a halfe, your quotient standeth 2250, as in the second worke of the example: Now come wee to the third place, where we find 6, we reckon the halfe of 6 is 3, or there is three times 2 in 6, wee open 3 in the same place, and our quotient standeth 2280, as in the third worke of the example: So wee come to the last place, where finding 8, we reckon in the same place, the halfe of 8 is 4, or there is 4 times 2 in 8, wee set 4 in the

the ſame place, & our whole quotient is 2284, as in the fourth worke of the example, which is the elder brothers portion; for the ſecond part of this worke, we goe to the fourth row of our Table, and there againe we take the halfe of this, beginning and proceeding as before, that is, the halfe of 2 is 1, the halfe of 2 is 1, the halfe of 8 is 4, and the halfe of 4 is 2, ſo our whole quotient ſtandeth in the fourth row 1142: ſo many acres are each of the two younger brothers to haue. And this method is to be obſerued in the mediation, or diuiding by 2, of any number whatſoeuer.

If three Partners had gained 576 li., the queſtion is, what each mans ſhare ſhould be: ſet 3 your Diuiſor in the firſt, and 576 your Diuidend in the ſecond row of your Table, thus; then point to the higheſt figure 5, and ſay the third of three is 1, or how many times 3 in 5, and the anſwere is 1, cancell 3 of the ſame 5, and open 1 in the ſame place, and in the third row of your Table; ſo haue you 100 in quotient, and 276 remaining, as in the example: Then come to the next place, and ſay the third of 27 is 9, or there is 9 times 3 in 27, ſet 9 in the ſame place, ſo haue you 190 in quotient, and 6 remaining, as in the ſecond worke of the example: Againe, point to the laſt place, and ſay, the third of 6 is 2, or there is 2 times 3 in 6, cancell the 6, and ſet 2 in the ſame place, ſo your whole quotient will be 192, as in the third work of the example; ſo much is each Partner to haue of the gaines. And this methode is to be obſerued, in diuiding by any of the Digits which ſoeuer, onely by 5 it is in our choice to vſe the ſame methode, or to point lower, and multiply by 2, which is a perfect Diuiſion by 5. Example:

	mi.	c.	x.	m.	c.	x.	li.	s.	d.
					2		3		
					5	7	6		
1					1				
2					1	9			
3					1	9	2		

If 675 were giuen to be diuided by 5, wee ſet our Diuiſor, and Diuidend in the firſt and ſecond row of our Table, thus.

Then in the third row, wee point to the high- eſt figures lower place, and multiply		mi.	c.	x.	m.	c.	x.	li.	s.	d.
								5		
						6	7	5		
	1					1	2	0		
	2					1	3	4		
	3					1	3	5		

it by 2, ſaying 2 times 6 is 12, we ſet 2 in the ſame place, and 1 in the higher place; ſo haue we 120 for the quotient of our firſt figure 6: then wee come to the ſecond figure 7, and pointing to his lower place, wee againe multiply 7 by 2, which maketh 14, we ſet 4 in the ſame place, and 1 in his higher place, and our quotient now ſtandeth 134; ſo wee come to the laſt figure 5, which to diuide by 5, it is in our choice to ſay, the fifth of 5 is 1, or once 5 in 5, ſo is it likewiſe 1; or pointing to his lower place 2 times 5 is 10, ſo in his owne place it is ſtill one; therefore we ſet one to the former, and our whole quotient will be 135, which is the iuſt fifth part of 675, as appeareth by the example.

If 29765 Crownes were giuen to bee diuided amongſt ſeuen Captaines, the queſtion is, what each Captaine ſhould haue: to worke this, we place our numbers in our Table thus;

and then examining our figures, we finde that wee cannot haue 7 in our firſt figure, being but 2, we	mi.	c.	x.	m.	c.	x.	li.	s.	d.
							7		
				x	3	x	1		
			x	9	7	6	5		
				4					
				4	2				
				4	2	5			
				4	2	5	2		

therefore

therefore point to the next lower place, and demand how many times 7 in 29, the anſwere is, 4 times 7 is 28, ſo we cancell 28 of the ſame 29, and ſet 4 in the ſame place, being the place of thouſands, whereby our quotient ſtandeth 4000, our remaines 1765. Againe, we point to the next lower place, being the place of hundreds, and there wee examine how many times 7 in 17; the anſwere is 2 times 7 is 14, we cancell 14 of the ſaid 17, and ſet 2 in the ſame place, making our quotient 4200, our remaines 365. Yet againe, we point lower to the place of tenns, and demand how many times 7 in 36, where we find 5 times 7 is 35, we cancell 35 of the ſaid 36, and ſet 5 in the ſame place, ſo our quotient is 4250, our remaines 15. To conclude, wee examine how many times 7 in 15, and the anſwere is 2 times 7 is 14, wee cancell 14 of 15, and ſet 2 in the laſt place, and then our whole quotient will be 4252, and one remaining: ſo it appeareth, that each Captaine muſt haue 4252 Crownes, and 1 Crowne for the accomptant, which is the anſwere of the queſtion.

Thus haue we inſtructed the methode and vſe of our Table, in diuiding by a Digit, or ſingle figure, whereby the ingenious practitioner might eaſily conceaue the order of diuiding by any number whatſoeuer. But becauſe the inuention is new, the worke extraordinary, and as yet concealed, we will therefore produce ſome examples, with their inſtructions of diuiding by diuers figures in our Diuiſor. Wherein you muſt obſerue the order before taught, of placing your Diuiſor and Diuidend in the firſt and ſecond row of your Table; then your quotient number, as it riſeth, is alwaies to be placed iuſt in the ſame place of your third row, where you make your laſt Subtraction, except there be a Cypher in the laſt place of your Diuiſor, and then is it to be placed one place lower; likewiſe, if 2 Cyphers, 2 places lower; if 3, 3, and ſo forth how many ſoeuer.

Example.

If we were to diuide 2400 by 12, we ſet 12 in the firſt row, 2400 in the ſecond row, as in the example following; then we examine how many times 1 (the firſt figure of our Diuiſor) is in 2 (the firſt figure of our Diuidend), and the anſwere is 2 times; but before we cancell our 2, we againe examine, if wee

may haue the ſucceeding figure of our Diuiſor (being 2) ſo often in the next figure of our Diuidend (being 4) and finding that we may, we then cancell away our figures, ſaying, 2 times 1 in 2, and 2 times 2 in 4, then are we to ſet 2 in quotient, iuſt in the ſame place where we cancell our 4, that is in the place of hundreds; ſo our quotient ſtandeth 200, as in the example. But if we put a Cypher to our Diuiſor, making it 120, we then obſerue the ſame work, and by reaſon of that Cypher, we ſet our quotient a place lower, then where we make our laſt Subtraction, whereby it ſtandeth 20: if by 1200, we omit two places, and make our quotient 2; whereby you perceiue, that if your Diuiſor be either a Digit, or Compound number, your quotient alwaies riſeth in the place of your laſt Subtraction: but if you Diuiſor bee an Article number, looke how many Cyphers follow the laſt figure, ſo many places lower ought to ſtand the firſt figure of your quotient. And this is all that ought to be obſerued in any worke of Diuiſion whatſoeuer.

	mi.	c.	x.	m.	c.	x.	li.	s.	d.
						1	2		
				2	4				
					2				
						2			
							2		

Example.

If 8464 were giuen to be diuided by 16, we ſet our Diuiſor 16 in the firſt row of our Table, and our diuidend 8464 in the ſecond row thus.

	mi.	c.	x.	m.	c.	x.	li.	s.	d.
						1	6		
					1	5			
				3	2	4			
				8	4	6	4		
1					5				
2					5	2			
3					5	2	9		

Then

Then we examine, how many times 1 in 8, where wee finde 8, 7, or 6 times 1, but wee can neither haue 8.7, nor 6 times 6 in the next place; we therefore take 5 times 1 out of 8, leauing 3 in the ſame place: Then we point to the next place, and there we take 5 times 6, that is 30, we cancell the 3 that wee left in the higher place for 30, and ſet 5 in the ſame place, ſo our quotient ſtandeth 500, and our remaines 464. Againe, wee demand how many times 1 in 4, we find 4, or 3 times 1, but we cannot haue 4, or 3 times 6 in the figure following; ſo we take but 2 times 1 out of 4 in the ſame place, and point to the next place, where we are to take 2 times 6, that is 12, wee cancell 1 of the higher place for 10, and 2 in the ſame place maketh 12, and there wee ſet 2, making our quotient 520, our remaines 144, as in the ſecond worke of the example. Yet againe, wee might haue 1 in the place of hundreds, but we cannot haue 6 in the next lower place, wherefore wee begin in the place of tens, and there we take 9 times 1, to doe which, we cancell the 1 in the higher place, & open 1 in the ſame place, from whence we fall to the place of Vnities, where wee are to haue 9 times 6, that is 54, we cancell the 5 in the higher place, and the 4 in the ſame place, and there wee ſet 9 in quotient; ſo our whole quotient ſtandeth 529, as in the third worke of the example. And this may ſuffiſe for your inſtruction, hauing two figures in your Diuiſor: the next example ſhall ſhew you how to diuide by three figures in your Diuiſor.

If 26112 were to be diuided by 768, wee ſet our numbers in our Table thus, and conſider that we cannot haue 7 in our firſt place, we therfore point to the ſecond place, and examine how many times 7 in 26, wee finde 3 times 7 is 21, wee cancell the 2 in the higher place,

mi.	c.	x.	m.	c.	x.	l.	s.	d.
				7	6	8		
			3	2	3			
			5	3	7			
		2	6	1	1	2		
					3	4		

place,and 1 in the ſame place,ſo remaineth 5112 : we point to the next place,where we are to haue 3 times 6,that is 18, wee cancell the 5 in the higher place,and open 3, ſo haue we taken 20, ſaying, 18 out of 20 remaines 2, we open 2 in the ſame place,ſo haue we taken 18,and now remaineth 3312 : againe, we point to the next place,where we are to haue 3 times 8 (being 24),we cancell the 3 in the higher place,ſaying, 24 out of 30,reſt 6,which 6 we open in the ſame place,ſo haue we taken 3 times 8 in the third place, right vnder which place we ſet 3, ſo is our quotient 30,and our remaines 3072, and our numbers now ſtand in our Table thus. Yet againe we find that wee cannot haue 7 in the

mi.	c.	x.	m.	c.	x.	li.	s.	d.
				7	6	8		
				2	3			
			3	0	7	2		
					3			
						4		

firſt place,we therefore point to the ſecond, and examine how many times 7 in 30, the anſwere is, 4 times 7 is 28,out of 30 reſt 2,wee cancell the three in the higher place, and open 2 in the ſame place ; ſo haue we taken 4 times 7, and our remaines is 272 : we deſcend to the next place,and there are we to haue 4 times 6,that is 24,we cancell the 2 in the higher place,and 4 out of 7 in the ſame place ; ſo haue we taken 4 times 6, and left 32 remaining : we come to the laſt place,where we are to take 4 times 8,that is 32,we cancell the 3 in the higher place, and the 2 in the ſame place,ſo haue wee taken 4 times 8 in the laſt place,iuſt vnder which place we ſet 4,making our quotient 34, our remaines 0 ; whereby appeareth, that 768 is iuſt 34 times contained in 26112,and this methode is to be obſerued in any Diuiſion whatſoeuer,by our Table. For your further inſtruction of diuiding by 4, 5, or 6 figures, obſerue theſe examples following, and by them all other, of how many figures ſoeuer.

If the great Turkes Army conſiſt of 370344 men, and thoſe men

men are diuided into 2374 Companies, the queſtion is, how many men are in each Company; ſet your Diuiſor in the firſt row of your Table, your Diuidend in the ſecond row, and your quotient as it riſeth in the third row, as in this example following, then worke as is formerly taught, and you ſhall find 156 men, in each Company.

	x.	mi.	c.	x.	m.	c.	x.	li.	s.	d.
Diuiſor					2	3	7	4		
Diuidend			3	7	0	3	4	4		
Quotient						1	5	6		

If 1667008 Spaniſh Royals were giuen to be equally diuided amongſt 26047 common Souldiers, the queſtion is, how many Royals were each Souldiers part; ſet your numbers, as in this example, then diuide your number of Royals by your number of men, and you will find 64 Royals for each man.

	x.	mi.	c.	x.	m.	c.	x.	li.	s.	d.
Diuiſor men					2	6	0	4	7	
Diuidend royals			1	6	6	7	0	0	8	
Quotient								6	4	

In this laſt example you are to obſerue, that hauing a cypher in your Diuiſor, when you come to worke for that cypher, you are to paſſe one place, and ſo worke forward, for 4 and 7 that follow the cypher, as heere you haue 6 times 2 in the firſt place, 6 times 6 in the ſecond place, then commeth your cypher in the third place, therefore wee paſſe the third, and come to the fourth place, there reckoning 6 times 4 is 24; ſo in the fifth Note.

place, 6 times 7 is 42, in which place we set the first figure of our quotient 6; and this must you alwaies obserue, when one or more cyphers happen to fall betweene the figures in your Diuisor.

For proofe of any Diuision, multiply your Diuisor by your Quotient, or your Quotient by your Diuisor, and the product (if you haue truly diuided) will be your Dividend, which is a most sure proofe of any Diuision whatsoeuer. These examples we hold sufficient for your practice alone, if yet you be doubtfull, or that they seeme difficult vnto you, be but once or twice shewed them, by one that can instruct you, and you will then confesse with vs, that no Arte is more easie, nor more delightfull in the working, then Diuision by our small Table. And so we conclude our fourth and last Branch, with our former affirmation, that seeing our Table is capable of these 4, it is likewise capable of all questions whatsoeuer Arithmeticall.

Of Reduction.

REduction is a work depending only vpon Multiplication or Diuision, and serueth only for the reducing of Monies, Weights, Measures, times, or any other thing out of one denomination into another, that is to say, things of a grosse denomination into a more subtle (which is wrought by Multiplication); or things of a subtle denomination into a more grosse, (which is wrought by Diuision), yet so, that they still retaine their first value. Reduction of monyes. As in money, 1 li. reduced into shillings, maketh 20 shillings, and are still alike in value; so 1 s. reduced into pence, maketh 12 d. which is all one in value: Likewise one penny reduced into farthings, maketh 4 farthings: so that when you will reduce a grosse denomination into a more subtle, you must consider how many of the subtle are in one of the grosse, and by that number multiply the other sum, the product shewes your desire. A thwart example thereof. As if you would know how many shillings is in 25 li., you must multiplie 25 li. by the number of shillings in 1 pound (that is by 20), and the product giueth 500 shillings. Againe, to know how many pence is in 500 shillings, you must multiply 500 shillings by the number of pence in 1 Analogy or playn Exm.

ſhilling, that is by 12, and the product will bee 6000 pence: likewiſe if you wil reduce 6000 pence into farthings, you muſt multiplie by the farthings in one penny, that is by 4, and you produce 24000 farthings. Now to know how many ſhillings is in 24000 farthings, you know there is 48 farthings in one ſhilling, therfore diuide 24000 by 48, and the quotient giues you 500 ſhillings. Againe, to know how many pounds is in 500 ſhillings, diuide 500 by 20, the quotient giues you 25 li. And this is all belonging to any Reduction of moneies. Of weights there are two kinds, the firſt Troy weight, of which the leaſt quantity is a graine, 24 graines make a penny waights, 20 penny waights one ounce, and 12 ounces one pound. Now in 12 pound waight Troy, I demand how many ounces, penny waights and graines there are: which to know, you muſt multiply 12 li. by 12, the ounces of one pound, and ſo haue you 144 ounces; then multiply 144 ounces by 20, the penny waights of one ounce, ſo haue you 2880 penny waights; then multiply 2880 penny waights by 24. the graines of one penny waight, and you haue 69120: ſo the anſwere is, that you haue in 12 li. Troy waight, 144 ounces, 2880 penny waights, and 69120 graines. Now if you would reduce theſe 69120 graines into pounds, you muſt firſt know how many are in one pound, or you may firſt diuide by 24, to make penny waights, then by 20 to make ounces, and then by 12, to make pounds; ſo ſhall you finde euery Reduction backe to anſwere the forward, and the concluſion to bee 12 li. waight, as at the beginning.

48 farthings in 1. ß.

Reduction of weights to coniſt troy waight

The other waighes vſuall, are Haberdipoyſe waight, of which 112 li. maketh 100 waight. 56 li. the halfe hundred, 28 li. the quarter hundred, and ſo downeward to 14 li., and 7 li., euery pound containeth 16 ounces, and euery ounces 2 halfes, and 4 quarters; ſo that if you would reduce hundreds into pounds, you muſt multiplie your number of hundreds by 112, and if you would reduce pounds into ounces, you muſt multiplie your number of pounds by 16, the number of ounces in one pound, and ſo forth of the reſt.

Example.

In 6 C. ½ and 9 li. waight, how many pounds, and how ma-

ny ounces: answere, multiply 6 by 112, and the product will be 672; then adde into the product 56 for the halfe hundred, and the 9 odde pounds, so haue you for the whole number of pounds, 737 li.; then to put them into ounces, multiply 737 by 16, and the product will bee 11792 ounces. Againe, to know how many pounds are in 11792 ounces, diuide the ounces by 16, and the quotient giues you 737 li.; then to know how many hundred waight are in 737 li., diuide 737 li. by 112, and you haue 6 C. and 65 li. remaining; from which take 56 for a halfe hundred, and you haue 9 remaining: so the answere is, that in 11792 ounces, there is 737 li.; and in 737 li., there is 6 C. $\frac{1}{2}$, and 9 li.; and this may suffise for waights.

Reduction of Measures as for example of a Dutch yard into smaller measures, all parts thereof, as halfe yards, quarters, halfe quarters, and nailes. One yard is foure fifth parts of one Ell. So 5 parts of one Ell $\frac{1}{5}$.

Concerning measures, we vse onely the yard, which is diuided into 2 halfes, 4 quarters, 8 halfe quarters, and 16 nailes. And the Elle, which is diuided into 2 halfes, and 4 quarters; so that if you would reduce any of them into other of his owne parts, you must know the part, you would reduce it into, and by that part multiply the number, that you would reduce, of which the reasons aforegoing, are sufficient instructions. But if you would reduce the one into the other, as yards into elles, or elles into yards, you must note, that one elle is 5 quarters of a yard, and one yard is but 4 fifth parts of an elle; so that if you would know how many yards are in 27 elles, you must multiplie 27 by 5, and you produce 135, this you must diuide by 4, and the quotient giues you 33 and 3 quarters, yards. Againe, if you would reduce 33 and 3 quarters, yards, into elles, you must multiply 33 by 4, and adde your three quarters into the product, so haue you 135 quarters; diuide that by 5, and the quotient giues you 27 elles; so you see, that to reduce elle into yards, you must multiply by 5, and diuide by 4; and to reduce yards into elles, you must multiply by 4, and diuide by 5: and this may suffise concerning these measures.

Reduction of time greater into small or parts

In the reduction of time, you must note, that our vsual reckoning is by yeres, moneths, weeks, daies, howers, and minutes: of which one yeere containeth 13 moneths, and one moneth 4 weekes, and one weeke 7 daies, and one day 24 houres, and one houre 60 minutes; So that if we should demand how many moneths,

moneths, weeks, daies, houres, and minutes, are in 7 yeeres, you muſt firſt multiply 7 by 13, the moneths of 1 yeere; ſo haue you 91 moneths: then multiply 91 by 4, the weeks of one moneth; ſo haue you 364 weekes: then multiply 364 by 7, the daies of one weeke; ſo haue you 2548 daies: againe, multiply 2548 daies by 24, the houres of one day; and you haue 61152 houres: laſtly, multiply 61152 houres by 60, the minutes of one houre; and the product will be 3669120 minutes. So the anſwere is, that in 7 yeeres there is 91 moneths, 364 weekes, 2548 daies, 61152 houres, and 3669120 minutes. Likewiſe if you would know how many houres, daies, weekes, moneths and yeeres are in 3669120 minutes; you muſt diuide your nũber of minutes firſt by 60, the minutes in one houre; and that againe by 24, the houres in one day; and ſo by 7, the daies in one weeke; by 4, the weekes in one moneth; and laſtly by 13, the moneths in one yeere: ſo ſhall you haue backe againe 61152 houres 2548 daies, 364 weekes, 91 moneths, and 7 yeeres. And thus of what number ſoeuer: whereby you may perceiue, that reduction in generall is none other, then a foreknowledge, how many of the ſubtill is in one of the groſſe; and then by Multiplication, or Diuiſiõ, to make it more ſubtile, or more groſſe; which for that it tends to a multiplicitie of things, and thoſe things already handled by many worthy writers; which haue ſet forth many excellent Tables to that purpoſe, we here omit to ſpeake further of them, and conclude our Reduction.

Definition of Reduction generall.

Arithmeticall Progreſſion.

ARithmeticall Progreſſion is a briefe gathering together of many numbers, continually exceeding one another by equall difference, as 1.2.3.4.5. doe euery one exceede the other by one; alſo 2.4.6.8.10. doe proceede and exceede by the difference of 2: likewiſe 1.4.7.10.13. proceeding by the difference of 3, and ſo forth to any number, from any beginning, or by any difference.

Now for your ſpeedy adding together of any Progreſſion Arithmeticall, or naturall, you muſt firſt tell how many num-

bers, or termes there are, and ſet that number in one row of your Table; then in another row adde the firſt and laſt number of all your termes together. This done, conſider which of theſe two is an euen number; which you ſhall know by the laſt figure in any number: For if that be either a Cypher, or an euen figure, the number is euen; then of that euen number take the halfe, and by that halfe, multiply the other whole number, ſo ſhall you finde the iuſt ſumme of any Progreſſion Arithmeticall or naturall whatſoeuer: for no Progreſſion in theſe natures can bee ſo propounded, but either the number of their termes, or the firſt and laſt numbers added together, muſt bee euen, as will appeare by the following examples.

A Gentleman agreed with a Habberdaſher for a Beauer hat, which he would pay for in 12 moneths, after the order of naturall Progreſſion: that is to ſay, the firſt moneth 1 s., the ſecond 2 s., the third 3 s., and ſo forward to the end of 12 moneths, as in this example; the queſtion is, what the Habberdaſher had for his hat: to work this, we tel our number of termes, and find them 12, that 12 we ſet in the firſt row of our Table: then we adde our firſt and laſt numbers together, and they make 13, which we ſet in the ſecond row. Now finding that our number of termes is the euen number, being 12, wee therefore take the halfe, 6 for our multiplier, by which 6 wee multiplie our odde number 13, and find 78 for the totall of this Progreſſion, ſo many ſhillings had the Habberdaſher for his Hat, that is 3 li. 18 s. 00 d.

1	
2	
3	
4	
5	
6	s.
7	
8	
9	
10	
11	
12	

A Merchant hath 27 paire of ſilke ſtockings, which hee ſelleth by Progreſſion Arithmeticall, the firſt 2 s., the ſecond 4 s., and ſo exceeding by 2, ſo the twentie ſeuenth paire; the queſtion is, what the laſt terme ſhall be; how much he hath for all, and how much for euery paire of ſtockings. For this worke, ſet 27 in the firſt, and againe in the ſecond row of your Table: then multiply one of them by 2 (the common exceſſe) ſo haue you 54 your laſt terme; to which adde 2, your firſt terme, then haue you 56, and 27. Now of 56 take the halfe, 28 both for your multiplier, and alſo for the price of each paire of ſtockings: then multiply 27 by 28, and finde 756, ſo many ſhillings hath hee for

for all his ſtockings, which diuided by 20, maketh 37 li. 16 s. 00 d. So the anſwere is, that our 27 terme was 54, that our Merchant had 37 li. 16 s. 00 d. for 27 paire, and 1 li. 8 s. for each paire of ſtockings.

A Gentleman ſelleth his horſe, to bee paid for in 52 daies; the firſt day 1 d., the ſecond 4 d., the third 7 d., and ſo ſtill increaſing by 3, the queſtion is, what ſhall be the laſt terme, and how much he had for his horſe. From 52 (the number of places) abate one, then multiply 51 (the remaines) by 3, (the common exceſſe) your product will be 153, to which adde one, (your firſt terme) and then haue you 154 for your laſt terme: Now adde your firſt and laſt terme together, it maketh 155 for your ſecond number, and 52 for your firſt, which 52, being euen, take the halfe 26 for you multiplier, then multiply 155 by 26, and you produce 4030; ſo many pence is the Gentleman to haue for his horſe, which number if you diuide by 240 your quotient ſhewes you 16 li. 15 s. 10 d.

This may ſuffiſe for the finding of any terme, from the firſt to the laſt, the exceſſe being knowne, and alſo for their totall. But admit, that in a Progreſſion Arithmeticall, you know the number of termes, and alſo the firſt and laſt terme, but you know not the difference or exceſſe: then to find that difference, ſubtract the firſt terme from the laſt, and diuide the remaines by one leſſe, then your number of termes, your quotient ſhewes you the true exceſſe.

Example.

Nine men by equall exceſſe, from the firſt to the laſt are to pay a Summe of money by what exceſſe, or how much money I know not, onely I know the firſt muſt pay 15 li., and the laſt 63 li. I demand what the exceſſe ſhould be, and alſo the totall. To worke this, ſet 9 (your number of termes) in the firſt, 63 (your laſt terme) in the ſecond, and 15 (your firſt terme) in the third row of your Table. Then ſubtract 15 from 63, there remaines 48, diuide that 48 by 1 leſſe, then your number of termes, that is by 8, and your quotient ſhewes you 6 for the equall difference,

15	
21	
27	
33	
39	li.
45	
51	
57	
63	
324	

ference. Now for the totall of this Progreſſion, your workes aforegoing are ſufficient inſtructions; for if you adde 15 your firſt to 63, your laſt terme, they make 78, the halfe 39, multiplied by 9, produceth 351 li. for the whole ſum of money, as you ſee in the example aforegoing.

Againe, ſuppoſe that you know the number of termes, with the common exceſſe, but you want either your firſt, or laſt terme; therefore to find which you want, firſt abate one from the number of termes, then multiply the remaines by the common exceſſe, and if you want your firſt terme, abate that number from your laſt. Or if you want your laſt terme, adde that number to your firſt, and you haue your deſire. Which you may proue by the former example: for if you multiply 8, being 1 leſſe then your number of termes, by 6, your common exceſſe, your product will bee 48, which 48, if you abate from 63 (your laſt terme), your remaines are 15 (your firſt terme), or if to 48 you adde 15 your firſt terme, you produce 63 (your laſt terme), and ſo of any other in this nature.

When both the extreames are concealed, to finde them, diuide your totall ſumme by the number of termes, and dubble that quotient in one row of your Table; in another row multiply 1 leſſe then the number of termes by the common exceſſe, and ſubtract that product from your former quotient: laſtly, take the halfe of the remaines for your leaſt extreme; which being found, the former inſtruction teacheth to finde the greateſt.

When you neither know the extremes, nor the exceſſe, then muſt the leaſt extreme bee the common difference. To finde which, ſet your number of termes in two ſeuerall rowes of your Table; then adde one vnitie into one of them, and of the euen number take the halfe, by that halfe multiply the other whole number, and by the product of that multiplication, diuide the totall of your Progreſſion; the quotient ſhewes you both the leaſt extreme, and alſo the common exceſſe.

Example.

Seuen men are to pay me 20 li., each exceeding other by equall

equall difference: the question is, what they shall begin withall, and how continue: adde 1 vnto 7 maketh 8; then by halfe 8 multiplie 7, it produceth 28, by which diuide 20, and you shall find $\frac{5}{7}$ li., both for the least extreame, and also the common excesse: so the first man payeth $\frac{5}{7}$ li., the second $\frac{10}{7}$, that is $1\frac{3}{7}$, the third $\frac{15}{7}$, that is $2\frac{1}{7}$, and so forth, as in this example, all which maketh iust 20 li.

$\frac{5}{7}$	
1	$\frac{5}{7}$
2	$\frac{1}{7}$
2	$\frac{6}{7}$ li.
3	$\frac{4}{7}$
4	$\frac{2}{7}$
5	
20	0

To conclude, when you know both the extremes with the excesse, and not the number of termes, then bate the least extreame from the greater, diuide the remaines by the common excesse, and adde one to your quotient for the number of termes. Or if you adde both the extremes together, and by that number diuide the totall summe of your Progression, that quotient doubled, sheweth your number of termes.

Example.

A man and his wife haue liued in one tenement 40 yeeres, and the first 7 yeeres they had but onely one Acre of Land: but euerie 3 yeeres since they haue purchased another: the question is, how many Acres of Land they now haue? set 7, and 40 (your two extremes) in two seuerall rowes of your Table, then abate 7 from 40, there remaines 33, which diuided by 3, (the common excesse) giueth in quotient 11, to which adde one for the first 7 yeeres, and conclude that they haue now 12 Acres of Land to their Tenement, as is manifest by the margent.

Yeeres.	Acres.
7	1
10	2
13	3
16	4
19	5
22	6
25	7
28	8
31	9
34	10
37	11
40	12

Or if you know the Totall summe of any of these two Progressions, either of the yeeres, or of the Acres, adding the two extremes together, and diuiding that totall by that number, the quotient doubled, shewes the number of termes; as if you take the totall of the Progression by yeeres, you will finde it

282, which diuided by 47, your two extremes, giueth in quotient 6, which 6 doubled maketh 12: or if you take the totall of that Progreſſion by Addes, you will finde 78, which diuided by 13, the fourth 6, and doubled, maketh 12, the number of termes, as before. And this is ſufficient to haue ſpoken of Arithmeticall Progreſſion.

Of Geometricall Progreſſion.

IT is called Geometricall Progreſſion, when euery number containeth his former number, 2.3.4.5.10.20. ; or as many times as you will, and in ſuch proportion as the ſecond is to the firſt; in the ſame proportion ſhall the third be to the ſecond; likewiſe the fourth to the third, the fifth to the fourth, and ſo forward how many ſoeuer, as if wee begin with 2, we doe not ſay 2.4.6.8.10, and ſo increaſing by 2, as in Arithmeticall Progreſſion, but we begin 2.4.8.16.32.64, and ſo continually doubling our laſt number, till we finde the terme looked for, which is true double proportion: likewiſe 3.9.27.81.243, &c. is direct triple proportion; alſo 4.16.64.256.1024, is proportion quadruple. Whereby you may ſee a great difference betweene Arithmeticall, and Geometricall Progreſſion: for the firſt is onely a continuall Addition of the difference into the laſt number, thereby to produce the next; and the latter is a continuall Multiplication of the laſt number by the generall proportion, thereby to produce a number proportionable to it ſelfe, as it ſelfe is to the number afore going, which is the only ground whereupon the rule of three, commonly called the golden rule, or the rule of 4 proportionalls worketh.

Now to finde the totall of any Progreſſion Geometricall, you ſhall diuide the ſecond number by the firſt, and the quotient ſhewes you the generall proportion; then multiplie the laſt number of your Progreſſion by that quotient, and from the product of that Multiplication, abate the firſt number of your Progreſſion: laſtly, diuide the remaines by one leſſe then you multiplied, and this laſt quotient ſhewes you the true totall of your Progreſſion.

Example.

A Merchant couenanteth with a ſhip-wright to build him a ſhip of 260 tun, that is (by the Mariners account) 13 ſcore, conditioning that for the firſt ſcore he will haue 2 s.; for the ſecond 4 s.; for the third 8 s.; and ſo forward, according to double proportion in Geometricall Progreſſion, the queſtion is, what the ſhip-wright had for his ſhip. To worke this by your Table, (wanting places to ſet your numbers in order) you may ſet them to the ſeuenth terme, then multiplie that ſeuenth by the ſixth number, and the product of that Multiplication ſhall ſhew the thirteenth number: for as 7 and 6 doe make 13, ſo the ſeuenth and ſixth numbers multiplied together, muſt needes make the thirteenth number; the like of any other in Geometricall Progreſſion, whoſe beginning and proceeding is by one and the ſame proportion, as in this example we take 128 and 64, our ſeuenth and ſixth numbers, which wee multiplie the one into the other, and they make 8192, our thirteenth number. Now to ſumme our whole Progreſſion, we take our laſt number 8192 and multiply it by the general proportion, that is by 2, ſo haue we 16384, from which we abate 2 our firſt number, ſo remaineth 16382; this diuided by one leſſe, that is by one, leaueth ſtil 16382 (for one doth neither multiply nor diuide); therefore wee conclude, that our ſhip-wright had for his ſhip 16382 s., which diuided by 20 maketh 819 li. 4 s. 0 d.: and in this manner muſt you gather the Totall of any Progreſſion Geometricall whatſoeuer.

2	
4	
8	
16	
32	
64	
128	
256	
512	
1024	
2048	
4096	
8192	8192

Againe, if your Progreſſion be in triple proportion, ſet them downe to the ſixth terme, as in this example following; then if you deſire the tenth number, you know that two times 5 is 10, therefore multiplie the fifth number 243 by 243, it produceth 59049 your tenth number: likewiſe, if you deſired your eleuenth number, take the fifth and ſixth, that is 243 and 729, multiplie the one into the other, and your product will be 177147 your eleuenth terme: in briefe, whatſoeuer terme you deſire, take two numbers, whoſe places in the Progreſſion may make that Totall; as if you deſire the ſeuenteenth terme,

take 9 and 8, 10 and 7, 11 and 6, or any other, multiply them together, and that product is the seuententh number, as here, wee multiply 177147 by 729, our eleuenth and sixth numbers, and our product is 129140163 for our seuententh number; and thus may you finde any number that you can desire at 1 or 2 multiplications, if (as we said) your Progression begin and continue by one, and the same proportion.

3	1
9	2
27	3
81	4
243	5
729	6
0	7
0	8
0	9
59049	10
177147	11
0	12
0	13
0	14
0	15
0	16
129140163	17

But if your first number be either more or lesse, then your generall proportion, then must your worke as before, and the product of your Multiplication shall be in the same proportion to the terme desired, that your first number is to the generall proportion; as if wee begin with 6.18.54.162.486.1458 (as in this example), and that we desired our twelfth terme, we take our sixth, 1458, and multiply it by it selfe, so is our product 2125764. Now because our first number 6 is double to 3, therefore we say, that the halfe of this number is our twelfth terme, which being taken, giueth 1062882, as in the example.

6	1
18	2
54	3
162	4
486	5
1458	6
	7
	8
	9
	10
	11
1062882	12

Againe, if we begin with 5.15.45.135.405.1215, as in this example, and that wee desire our eleuenth terme, wee take 405, and 1215, our fifth and sixth numbers, which we multiplie together, and they produce 492075. Now because our first number is 5, & our proportion but 3, therefore we say, that this product is to our eleuenth terme, as 5 to 3, wherefore wee take

take ½ of 491075, and our quotient is 295245 for our eleuenth terme, as in this example; and this being all that is to be obserued for the finding of any terme from any beginning by any proportion whatsoeuer, wee here conclude our Rules of Progression.

5	1
15	2
45	3
135	4
405	5
1215	6
0	7
0	8
0	9
0	10
295245	11

The Rule of 3 Direct.

THe Rule of 3, or rather the Rule of 4 proportionals, commonly (and worthily) called, The Golden Rule, is vsually distinguished in 3 parts or properties; that is to say, Direct, or forward; Reuerse, or backward; Double, or composed; whose nature and operation is by 3 numbers knowne, to finde out a fourth number yet vnknowne, which fourth shall beare the same proportion to one of those 3, that the other 2 beareth each to other, *namely the Second to the Third.*

Now for your instruction in the Direct or forward Rule of 3, you shall alwaies set your first number in the first row, your second number in the second row, and your third number in the third row of your Table. Then multiplie your second number by your third, and diuide the product of that Multiplication by your first number, and the quotient shewes you a number proportionable to your third, as your second number is to your first.

Example.

If 15 Elles of Holland doe cost me 36 shillings, what shall 25 Elles cost me at that rate? See your numbers according to your former instruction, as in this example, then mul-

	l.	s.	m.	c.	l.	li.	q.	d.
Elles					1	5		
Shillings					3	6		
Elles					2	5		
Shillings					6	0		

plie the ſecond number by the third, that is 36 by 25, and the product will be 900, diuide this 900 by your firſt number 15 and the quotient giues you 60 for your fourth number, which 60 beareth the ſame proportion to 25, that 36 beareth to 15, where you muſt obſerue, that as your firſt and third numbers are of one, and the ſame denomination (that is Elles), ſo likewiſe your ſecond and fourth numbers are of one denomination (that is ſhillings): whereupon we conclude, that if 15 Elles coſt 36 s., then 25 Elles muſt coſt 60 s.

But for your greater eaſe, and more certaintie in this worke, you ſhall conſider, whither your third number bee greater or leſſe then your firſt number, and according to your knowledge in that kinde, you ſhall neuer faile of your right multiplier or diuiſor, as in this queſtion. If 15 Elles coſt 36 s. what coſt 25 Elles? the anſwere is, more then 36 s.; and becauſe it is more, therefore we muſt multiply 36 s. by the more, and diuide by the leſſe, whereby wee are aſſured both of our multiplier and diuiſor: for in the Rule of 3 Direct, more doth alwaies require more, and leſſe requires leſſe, and this is all you are to remember in any poſition of this nature whatſoeuer.

If 12 yards of Veluet coſt mee 9 li. in money, how many yards of Veluet ſhall I haue for 6 li. in money? Here you muſt obſerue, that although 12 yards of Veluet be firſt named, yet is it not the firſt number, becauſe the third number is not of the ſame denomination; and if you ſhould now ſet 12 in your firſt row, 9 in your ſecond row, and 6 in your third row, and then multiplie and diuide, as in the former example, you ſhould ſurely make a falſe worke, therefore when any queſtion is thus propounded, you muſt conſider which number wanteth his proportionall, and that ſhall alwaies bee your third number, then muſt your firſt number be of like denomination, and your ſecond number will bee the proportionall to the firſt, as heere you ſee, that 6 li. wanteth his proportionall, therefore 6 li. is your third number; then 9 li. is of like denomination, and muſt be your firſt number, and 12 yards is his proportionall: ſo that in this (or the like eaſe) you muſt in your diſcretion varrie your poſition for the right ſetting of your numbers. As thus: If 9 li. of money doe buy me 12 yards of Veluet, how many yards of Veluet,

Veluet will 6 li. in money buy me? then will your numbers stand in your Table thus: and the answere to your position will be lesse then 12 yards; therefore 12 yards must be multiplied by the lesse, that is by 6, and thereof commeth 72; and diuided by the more, that is by 9, and your quotient giues you 8 yards for your 6 li., which is the fourth proportionall. This duly considered, and well remembred, may be sufficient for the finding of your multiplier and diuisor, howsoeuer the question be propounded.

	li.	m.	c.	x.	li.	s.	d.
Pounds					9		
Yards				1	2		
Pounds					6		
Yards					8		

If 42 Nobles doe buy me 6 quarters of wheate; how many quarters of wheate will 56 li. buy me? Here you see, that no two numbers are of one denomination, and yet two of them are moneyes; therefore you must reduce, and bring them into one denomination, either by bringing your 56 li. into Nobles, or your 42 Nobles into pounds. Which to do, you must consider that 3 Nobles is one pound, and if you multiplie 56 li. by 3, you shall finde 168 Nobles; so that now your first and third numbers are of one denomination, and will stand in your Table thus. Also the answere of your position will be more then 6 quarters, therefore 6 quarters must be multiplied by (the more) 168, and the product will bee 1008, diuide this by the lesse, 42, and the quotient giues you 24 quarters for your 56 li. and also your fourth proportionall.

	li.	x.	m.	c.	x.	li.	s.	d.
Nobles					4	2		
Quarters					6			
Nobles				1	6	8	2	
Quarters					2	4		

If 234 yards of Otras bee lined with 156 Elles of Canuas, how many Elles of the same Canuas will line 1479 yards of Otras? Here you see, that your first and third numbers are of one denomination; therefore you must let them, as they are propounded, as in the example following. Then multiply 156 by 1479, and the product will be 230724; diuide this by

	c.	q.	m.	c.	q.	li.	s.	d.
Yards				2	3	4		
Elles				1	3	6		
Yards			1	4	7	9	2	
Elles				9	8	6		

234, and your quotient shewes you 986; so many elles of Canuas will line 1479 yards of Ormus, if 156 Elles doe line 234 yards.

These examples may suffise for the Rule of 3 Direct.

The Reuerse, or Backward Rule of three.

IT is called the Reuerse, or Backward Rule of three, when the Antecedent being great, requires a small consequent: that is when a great number requires a small proportion, and accordingly by how much the greater that number is, by so much the lesse shall his proportion be: so that in this Rule, more doth not require more, and lesse require lesse; but contrary, more requires lesse, and lesse requires more. Nor is this the onely reason: for you may obserue, that in the Rule of 3 Direct, that Antecedent which wanteth his consequent, is alwaies your multiplier, and the Antecedent hauing his Consequent is your diuisor. But in the Reuerse, or Backward Rule of 3, the number hauing his consequent is alwaies your multiplier: and the number wanting his consequent, your diuisor. For which reason, as well as for any other, it is fitly and aptly called the Reuerse or Backward Rule of 3: the consideration of which, together with our former inquirie of more or lesse, shall be a great helpe to vs for the right choosing and placing of our numbers; as you shall perceiue by the examples.

If 12 men in 15 daies doe build a wall of 10 foote high, in how many daies will 45 men build the same wall? First, you must consider, that 45 your first Antecedent, wanting his consequent, must be your diuisor; therefore set 45 in the first row of your Table, then 15 daies, wanting his match-terme, must stand in the second row: lastly, 12 being of the same denomination with 45, requires the third row, then will your numbers stand in your Table as followeth. Now because 12 men requires 15 daies, 45 men must in reason require lesse

daies,

daies; wherefore wee must multiply our number of daies by the leſſe, that is by 12, and there of cõmeth 180, which wee muſt diuide by the more, that is by 45, and our quotient giues vs 4 daies. So the anſwer is, if 12 men do build the wall in 15 daies, then 45 men will build it in 4 daies, as appeareth by the example.

	x.	m.	c.	x.	li.	s.	d.
Men				4	5		
Daies				1	5		
Men				1	2		
Daies					4		

If 9 s. 4 d. in Bread doe ſuffiſe 126 men, when the Buſhell of wheate coſt 6 s. 4 d.; how many men will the ſame ſuffiſe, when the Buſhell of wheate coſt but 3 s. 6 d.? Firſt, ſet 126 men in the ſecond row of your Table, then reduce 6 s. 4 d. and 3 s. 6 d. all into pence, and you ſhall haue 76, and 42 pence, place the one in the firſt, and the other in the third row of your Table, then will your numbers ſtand thus. Now becauſe in reaſon it will ſeeme for more men when the wheat is cheaper, therefore you muſt multiplie by the more, that is by 76, and your product will be 9576; and diuide by the leſſe, that is by 42, and the quotient ſhewes you 228. So many men will the ſaid 9 s. 4 d. ſuffiſe, when the buſhell of wheat coſt 3 s. 6 d., if it ſuffiſe 126 when the buſhell coſt 6 s. 4 d. And thus we conclude our Reuerſe or Backward Rule of three.

	x.	m.	c.	x.	li.	s.	d.
Pence				4	2		
Men			1	2	6		
Pence				7	6		
Men			2	2	8		

The Double Rule of Three.

THe Double Rule of 3 is ſo called, both becauſe it requires a twofold working, and anſweres a twofold queſtion; in whoſe operation there is a twofold obſeruation, firſt, that you chuſe two numbers of one denomination for your firſt and third numbers, with the value, time, or quantitie, for the middle terme. Secondly, that the fourth number of your firſt

worke, is alwaies the ſecond number in your ſecond worke. Theſe two, with the helpe of your former inquirie of more or leſſe, will ſo further you in the right placing your numbers, or (as we may terme it) for the right going into your queſtion, that you ſhall finde great eaſe in the working: for many queſtions are ſo propounded, that to finde the order is more difficult to a learner, then to worke the queſtion. Therefore it behooues you to conſider the congruitie of your numbers, before you enter your worke: for this Double Rule ſometimes requires the Direct Rule of 3, for both workings; ſometimes the Direct for one, and Reuerſe for the other: which if you ſhould miſtake, you muſt needes commit an euident, and groſſe error.

If the carriage of 20 li. waight 50 miles coſt me 2 s., what ſhall the carriage of 60 li. waight, 100 miles coſt me? Heere you ſee that 20 and 60 li. waight are both of one denomination; likewiſe 50 and 100 miles; alſo that 2 s. is conſequent to the leſſer of either. Therefore you may begin thus, If 20 li. waight coſt 2 s. *Antec.* what coſt 60 li. waight? *Conſequent.* ſet your numbers in your Table thus, then multiply and diuide, and you ſhall finde 6 s.

	x.	m.	c.	x.	li.	s.	d.
Pound waight				2	0		
Shillings					2		
Pound waight				6	0		
Shillings					6		

Againe, if 50 miles coſt 6 s, what coſt 100 miles, ſet your numbers in your Table thus. Then worke as before, and you ſhall finde 12 s.: So the anſwere is, that if 20 li. waight carried 50 miles coſt 2 s., then 60 li. waight carried 100 miles, will coſt 12 s.

	x.	m.	c.	x.	li.	s.	d.
Miles				5	0		
Shillings					6		
Miles			1	0	0		
Shillings				1	2		

Or (at your pleaſure) thus, If 50 miles coſt 2 s., what coſt 100 miles? the anſwere is 4 s. Againe, if 20 li. waight coſt 4 s., what coſt 60 li. waight? the anſwere is 12 s., as before: where-

Tycho Brahe magnum ſtudio de Vſibus Progreſſ. Aſtronomiæ touſtrinat genuinum Ordinem Locorum ipſis Tractandis dat notis, quam Obſeruationum-varietas eſtos ſubſcribi mos. docuit hoc nmorum in quæſtionibus propoſitorum ſimplicium ſummas ſe habeunda ſit diſtinctas ſeruet quo homonum modo homologi ac homonymi ſimul ſub eodem of am ſe ſeparari debeant ſeparatim ſumptis Valore tempore debi quantitate. Verum ſtructuræ totius contextus ſuis proprijs locis in Regula Trium, Vſu duo Homonymorum alterum ſemper ſibi amicam habet quæ ſolum de quanto mecum diſponantur eodem modo ſtatuit ut in quæſtionibus ſubſequentibus patebit. Itaque ſpongia hoc loco ſolutio 20 quanti & loco Primo, Terminus loco Heterogo by nous quæſt de Valore Tempore bol quantitate ſumma ſeu Loco Secundo ſen Modo Regulæ In Regula Trium Compoſita ſibo duplici duplex operatio

by you perceiue, that it is indifferent which 2 numbers of one denomination are first chosen, prouided that you rightly place the consequents as this easie question plainely demonstrateth.

If 128 li. stock doe gaine me 36 li. in 9 moneths, how much shall 96 li. gaine mee in 4 moneths? Both these questions are likewise to bee wrought by the Rule of 3 Direct; therefore set your numbers in your Table thus. Then say, if 128 li. doe gaine 36, what shal 96 li. gaine? worke and you shal find 27 li.: then say againe; If 9 moneths giue 27 li., what shal 4 moneths giue? worke and finde 12 li.: so the answere is, that if 128 li. doe gaine 36 li. in 9 moneths, then 96 li. shall gaine 12 li. in 4 moneths, which was the question demanded.

	x.	m.	c.	x.	li.	s.	d.
Principall			1	2	8		
Gaines				3	6		
Principall				9	6		
Gaines				2	7		

	x.	m.	c.	x	li.	s.	d.
Moneths					9		
Pounds				2	7		
Moneths					4		
Pounds				1	2		

If 10 Gardeners in 9 daies doe cast a Mount of 15 foote high, in how many daies shall 18 Gardeners cast a Mount of 27 foote high? in this question, the first part is to be wrought by the Reuerse or Backward Rule of 3: for the more men, the lesse daies, therefore frame your question thus. If 10 men require 9 daies, how many daies shal 18 men require? multiply and diuide, and you shal finde 5 daies. Then say againe, if 15 foote require 5 daies, how many daies shall 27 foote require; worke by the Rule of 3 Direct, and you will find 9 daies: so it holdeth good

	x.	m.	c.	x.	li.	s.	d.
Men				1	0		
Daies					9		
Men				1	8		
Daies					5		
Feete				1	5		
Daies					5		
Feete				2	7		
Daies					9		

in reaſon, that if 10 (in what time ſoeuer) doe giue 10, and halfe 10, that is 15, then in the ſame time muſt 18 giue 18, and halfe 18 that is 27, which is the proofe of the queſtion.

If 36 Crownes do gaine 48 s. in 12 moneths, in how many moneths ſhall 16 Crownes gaine 96 s.? this queſtion doth likewiſe require the rule reuerſe for his firſt operation; therfore ſet your numbers thus; then ſay, if 36 Crownes require 12 moneths, how many moneths ſhal 16 Cr. require? multiply and diuide, and you ſhall finde 27 moneths. This being found, ſay again, if 48 ſhillings require 27 moneths, how many moneths ſhall 96 ſhillings require? worke this latter by the rule Direct, and you ſhall finde 54 moneths: ſo the anſwere is, that if 36 Crownes in 12 moneths doe gaine 48 s.; then 16 Crownes ſhall gaine 96 s. in 54 moneths, which is the thing deſired: and thus haue wee giuen feuerall and eaſie examples, both of the Direct, Reuerſe, and alſo of the Double Rule of 3, whereby (with little obſeruation) you may be able to worke in any of them. Wherefore we will here conclude our firſt part of Arithmetick in whole numbers.

	x.	m.	c.	x.	li.	s.	d.
Crownes				3	6		
Moneths				1	2		
Crownes				1	6		
Moneths				2	7		
Shillings				4	8		
Moneths				2	7		
Shillings				9	6		
Moneths				5	4		

The end of the firſt Booke.

THE SECOND PART OF ARITHMETICK IN FRACTIONS.

Of Fractions.

A Fraction is a broken part, or parts of an Vnitie, or of any one whole and intire thing, as one whole yard, one pound, one ſhilling, one penny, or any one thing whatſoeuer. And it is vſually diſtinguiſhed by two numbers, the one called the Numerator, and the other the Denominator; of which the Numerator is alwaies ſet aboue, and the Denominator beneath, with a line betweene them thus, $\frac{1}{2}$, ſignifying one of two parts, or one halfe. Likewiſe two third parts, three fourth parts, foure fifth parts, and fiue ſixth parts are thus expreſſed, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$. of one Vnitie of any thing whatſoeuer.

Now in any fraction, the Denominator expreſſeth how many parts our Vnitie (whatſoeuer thing it be) is diuided into, and our Numerator, or numberer, ſheweth how many of thoſe parts are to be taken. For example, ſuppoſe that wee were to take two third parts of a ſhilling; wee know that a ſhilling containeth three groates (there haue we our Denominator 3), of which we take two groates, or 8 d. for our $\frac{2}{3}$ parts. Againe, if we ſhould take three fourth parts of a yard, we know that a yard hath foure quarters, of which wee take three quarters for our $\frac{3}{4}$ parts, and ſo of any other.

But you ſhall vnderſtand, that there are fractions of three kindes, that is to ſay, ſimple or proper fractions; forced, or improper fractions; and fractions of fractions.

Simple fractions are thoſe already handled.

Forced, or improper fractions are ſuch as contsine in them one, or many whole vnities, as $\frac{4}{3}$ is 1 $\frac{1}{3}$, or $\frac{6}{5}$ is 1 $\frac{1}{5}$; as if wee take $\frac{4}{3}$ of a ſhilling, we know $\frac{1}{3}$ to be one groate, then $\frac{4}{3}$ muſt bee 5 groates, that is one whole ſhilling, and $\frac{2}{3}$, or 8 d. Likewiſe $\frac{6}{5}$ of an Angell, we know the fifth of an Angell to be 2 s., then $\frac{6}{5}$ is ſixe times 2 s., that is one whole Angell, and $\frac{1}{5}$, or 2 s. Briefely, al ſuch whoſe Numerators are equall, or exceeding their denominators are called improper fractions.

The Definition of a Fraction of fractions, with the notation or part ſo called alſo.

Fractions of fractions are not a proper part, or parts of any intire thing, but they are a part or parts of ſome other part, or parts of a Vnitie: as one halfe, of two thirds, of three fourths; or two thirds, of three fourths, of foure fifths, whoſe expreſſion, (or ſetting downe) is in the manner of ſimple fractions, thus, $\frac{1}{2}$, of $\frac{2}{3}$, of $\frac{3}{4}$; or $\frac{2}{3}$, of $\frac{3}{4}$, of $\frac{4}{5}$, or the like: for although fractions of fractions doe ſeldome happen, (or at leſt may eaſily be preuented in any Diuiſion) yet when they doe happen, it is good to know their vſe, and how to reduce them. But for their plainer expoſition, let vs ſhew them by an example, ſuppoſe we were to take $\frac{1}{2}$ of $\frac{2}{3}$, of $\frac{3}{4}$ of a ſhilling, we know that $\frac{3}{4}$ is 9 d., then $\frac{1}{3}$ of 9 d. is 6 d.; and $\frac{1}{2}$ of 6 d. is 3 d.; ſo the $\frac{1}{2}$, of $\frac{2}{3}$, of $\frac{3}{4}$, is $\frac{1}{4}$ of 12 d.

Illuſtrated by thoſe two briefe, plaine examples here ſet downe, viz. the One, by example of 1 li. money. The Other, by example of Part of 1 ſhilling.

Againe, if we were to take the $\frac{2}{3}$, of $\frac{3}{4}$, of $\frac{4}{5}$, of a pound or 20 s., we know that 16 s. is $\frac{4}{5}$; then $\frac{1}{3}$ of 16 s. is 12 s.; and $\frac{2}{3}$ of 12 s. is 8 s.: ſo the $\frac{1}{2}$, of $\frac{2}{3}$, of $\frac{3}{4}$, of $\frac{4}{5}$, is $\frac{2}{5}$ and thus haue you the diuerſity of fractions.

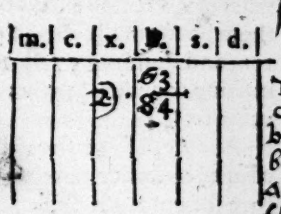
Of Abbreuiation, Or Reduction of

any ouer ſimple fraction ad [illegible]

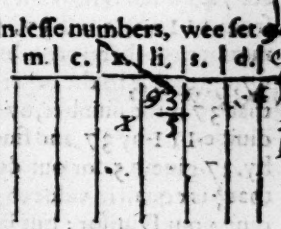
VVE begin with Abbreuiation, becauſe it is eaſie & vſefull: eaſie, in that it requires none other working then by Diuiſion in whole numbers, and that moſt times by one of the Digits; Vſefull, in that Multiplication, Diuiſion, Reduction, Addition, and Subtraction in fractions, do in many of their workings, require an Abbreuiation in the cõcluſion: ſo you ſee that Abbreuiation is a Rule proper only to fractions, whoſe operation is ſometimes by degrees (at many workings) & ſometimes

times at once, to bring our fractions into their leaſt termes or numbers, ſtil leſſening our numerator & denominator by equal Diuiſions, till wee haue made it ſo ſmall, that (in a fraction) it cannot bee ſmaller. In which worke, we are to make choiſe of ſome number, that may both diuide our Numerator and Denominator, without leauing any remainder; and the ſame number that diuideth the one, muſt diuide the other; elſe can it not bee a true abbreuiation, becauſe being at the ſmalleſt, yet his value muſt not bee diminiſhed, of which wee will giue you examples.

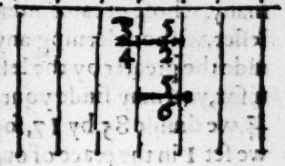
Suppoſe wee were to abbreuiate $\frac{6}{8}$ into their leaſt numbers, we ſet 6 in the firſt, and 8 in the ſecond row of our Table, thus: then we take the halfe of 6, leauing 3 in the firſt row, and the halfe of 8, leauing 4 in the ſecond row; ſo haue we $\frac{3}{4}$ for our $\frac{6}{8}$, which in value is all one.



Againe, if we would expreſſe $\frac{9}{15}$, in leſſe numbers, wee ſet 9 and 15 as before, and they ſtand thus: then we conſider what number will diuide them both, and wee finde onely 3; we therefore take the third of 9, cancelling 6, and leauing 3 in the firſt row, and likewiſe the third of 15, cancelling 10, and leauing 5 in the ſecond row, ſo haue we $\frac{3}{5}$ for our $\frac{9}{15}$.



Yet againe, if we would finde our leaſt number in $\frac{35}{42}$, we may conſider, that theſe two numbers can neither be diuided by 2, 3, 4, 5 nor 6; neither by 8, 9, 10; nor indeed by any number but only by 7. we therfore ſet them in our Table, thus: then we take of 35 (being 5) for our numerator, and of 42 (being 6) for our denominator; ſo haue we $\frac{5}{6}$ for our $\frac{35}{42}$, as in this example, and this manner are you to obſerue in any work of abbreuiation by our Table.



But

A

I.

But when your numbers are ſuch, that you cannot readily finde a number to diuide them both, then ceaſe not to ſubtract the leſſer number from the greater, till you make them both become one like number, and the ſame number will diuide them; as in the example following.

If we be not well vnderſtood in abbreuiation, we may happen to miſſe the number that will diuide theſe two; therefore to finde it, we ſubtract 19 from 57, the remaines are 38, which is yet the greater number; wherefore wee againe ſubtract 19 from 38, and now remaines 19, equall to our other number, whereby wee know, that 19 is the number that muſt diuide them both: ſo diuiding 57 by 19, we finde 3 for our numerator; and diuiding 57 by 19, we finde 3 for our denominator, making together $\frac{3}{3}$; whereupon we conclude, that $\frac{3}{3}$ is equall in value to $\frac{57}{57}$.

Againe, if we ſhould abbreuiate $\frac{111}{185}$, it were hard (without a Rule) to finde a number that will diuide theſe two: we therefore follow the Rule, and ſubtract 111 from 185, the remaines are 74, which is now the leſſer number; we againe ſubtract 74 from 111, there reſt 37, which likewiſe is become the leſſer number, we therefore ſubtract 37 from 74, and the remaines is 37, agreeable to the other number; whereupon wee conclude, that 37 is the number, by which $\frac{111}{185}$ is to be abbreuiated: ſo we diuide 111 by 37, and finde 3 for our numerator: likewiſe 185 by 37 giueth 5 for our denominator, whereby you perceiue, that $\frac{3}{5}$ is equall in value to $\frac{111}{185}$: and this may ſuffiſe for the finding your Diuiſor: but if theſe Subtractions doe neuer make two like numbers, till one become an Vnitie, then bee aſſured, that fraction cannot be expreſſed in leſſer termes, as $\frac{9}{17}$, $\frac{8}{25}$, $\frac{24}{35}$, $\frac{37}{210}$, and ſuch like, which can no way be abbreuiated; and therefore are called Prime numbers: the other that may be abbreuiated are called Compounds, of which Compounds there are many, whoſe greater numbers may bee euenly diuided by the leſſer, without leauing any remainder: of that kind if you diuide the greater by the leſſer, and ſet 1 in the place of your diuiſor, you may finde your leaſt numbers at one working, as in $\frac{17}{85}$, we diuide 85 by 17, ſo haue wee 5 in quotient, to which 5 we ſet 1 in the place of our diuiſor, it maketh $\frac{1}{5}$, and thus of any

To

To conclude, you ſhall obſerue, that whenſoeuer the laſt figures, both of your numerator and denominator are euen, that fraction may be abbreuiated by 2, it may be by 4, by 6, by 8, or ſome other euen nũber, which you in your iudgmẽt may make choyce of; if they both end with 5, you may certainely diuide them both by 5, If with a Cypher, or Cyphers, it is no more but ſet them lower, or reckon them as if there were no Cyphers, as $\frac{10}{20}$ is $\frac{1}{2}$, or $\frac{30}{70}$ is $\frac{3}{7}$, or $\frac{300}{500}$ is $\frac{3}{5}$, and ſuch like. But theſe things by your practice, wil come into your knowledge faſter, then your memorie will bee able to retaine them; wherefore we here conclude abbreuiation.

Of Reduction.

THe difficultie of working by fractions, proceedeth chiefely from the diuerſitie, or difference of the denominators: for if the denominators were a like number, it were eaſie, by adding the numerators together, to make one fraction of many, as in $\frac{2}{12}$, $\frac{3}{12}$, and $\frac{4}{12}$, we nede no more but adde 2, 3 and 4, to make $\frac{9}{12}$. But becauſe the denominators are diuers and different, therefore the antient Philoſophers haue diuiſed this work of Reduction, thereby to reduce, and bring them into one generall denomination, that ſhall be proper to all and each numerator, or of which, each numerator may take a part, in the ſame proportion to this generall denominator that it was before, to it owne particular denominator. And this worke of Reduction is generally diſtinguiſhed in foure varieties or differences.

1 The firſt teacheth to reduce, or bring into one denomination, diuers parts of any one Vnitie, whatſoeuer thing it be.

2 The ſecond teacheth, to reduce fractions of fractions into one denomination or proper fraction.

3 The third teacheth how to reduce improper fractions, into whole numbers, and their diſtinct fraction; or whole numbers and fractions into improper fractions, and ſo to ioyne them with other fractions, with other whole numbers, or with other whole numbers and fractions.

4 The fourth teacheth, to reduce a fraction of one kinde or denomination into a fraction, or fractions of another kinde, as

of vnlike denomination: so that still the latter may beare the same proportion to a Vnitie that the former did. And these wee take to bee the grounds, or principles of Reduction: of which kindes in order, we will shew seuerall examples wrought by the Table, and first of the first.

1 If you will reduce $\frac{3}{4}$ and $\frac{5}{6}$ into one denomination, you must set them in two rowes of your Table, thus: Where you see, we take the places of shillings and pence for the places of our denominators, not respecting their values, but applying them thus to serue our turnes. Being thus set, wee multiply our denominators, one into the other, that is to say, 4 by 6 maketh 24, this we set in the fourth row of our Table for our generall denominator; then we multiply croſſ-wiſe the numerator of our first fraction, by the denominator of our second fraction, that is, 3 by 6 maketh 18, which we set in the first row for our $\frac{3}{4}$; and againe the numerator of our second fraction by the denominator of our first fraction, that is 5 by 4 maketh 20 which we set in the second for our $\frac{5}{6}$: so haue wee $\frac{18}{24}$ for our $\frac{3}{4}$, and $\frac{20}{24}$ for our $\frac{5}{6}$, as you see in the example. Now if you will prooue your work, abbreuiate $\frac{18}{24}$, and you shall find $\frac{3}{4}$: likewise abbreuiate $\frac{20}{24}$, and finde $\frac{5}{6}$, which is the proofe of your Reduction.

x.	m.	c.	x.	li.	s.	d.
				3		4
			1	8		
				5		6
			2	0		
			2	4		

But if you will worke this, or any other another way, when you haue found your generall denominator, diuide it by the denominator of your first fraction, and multiply the quotient by the numerator of the same fraction: so shall you haue a new numerator to your generall denominator, and so proceede with all the rest, how many soeuer; as in this example you finde 24, your generall denominator, then to produce a numerator proportionable to $\frac{3}{4}$, diuide 24 by 4 the denominator and the quotient will bee 6, multiplie that 6 by 3, the numerator, so haue you $\frac{18}{24}$ for your $\frac{3}{4}$ as before: likewise if you diuide 24 by 6 your quotient will bee 4, which multiplied by 5, maketh $\frac{20}{24}$ for

for your $\frac{5}{8}$; or if you first multiply your generall denominator by the particular numerators, and diuide the products by the denominators, the effect is all one: but we esteeme the first of all for best, because it is briefest and easiest.

If you will reduce $\frac{3}{5}$, $\frac{5}{9}$, and $\frac{4}{7}$ into one denomination, you must set them in three rowes of your Table, thus. Then in the fourth row, multiply all your denominators, the one into the other, that is to say, 7 by 9 maketh 63, and 63 by 5 maketh 315 for your generall denominator: this done, to finde particular numerators, multiply euerie numerator (how many soeuer) by all the denominators, except it owne, and these products shall giue you new numerators, as in this example; multiplie 3 the numerator of your first fraction, by 9 the denominator of your second fraction; and againe by 7, the denominator of your third fraction, so haue you $\frac{189}{315}$, for your $\frac{3}{5}$. Then multiply 5, the numerator of your second fraction by 5, the denominator of your first fraction, and againe by 7, the denominator of your third fraction, so haue you $\frac{175}{315}$, for your $\frac{5}{9}$. Lastly, multiply 4, the numerator of your third fraction by 9, the denominator of your second fraction; and againe by 5, the denominator of your first fraction, so haue you $\frac{180}{315}$ for your $\frac{4}{7}$, and this is a generall rule, how many fractions soeuer you haue, of which worke and all other, the proofe is by abbreuiation, as in the former example. And thus wee conclude our first branch of Reduction of Fractions heterogeneous simple.

x.	m.	c.	x.	li.	s.	d.
				3		5
		1	8	9		
				5		9
		1	7	5		
				4		7
		1	8	0		
		3	1	5		

Of Reduction, the second branch. De particulis fractionis fractionum.

TO reduce fractions of fractions into one fraction, you haue no more to doe, but multiply all the numerators one into another, and thereof make a new numerator. Likewise, multi-

plie all the denominators one into another, and thereof make a new denominator, as in this example.

If you will reduce $\frac{2}{3}$ of $\frac{1}{5}$ of $\frac{3}{7}$ into one proper fraction, set them in your Table, thus. Then multiply 1 by 2 maketh 2; and 3 by 2 maketh 6; set that in your third row for your new numerator: then multiply your denominators one into the other, that is 5 by 3 maketh 15, and 15 by 7 maketh 105 for your denominator; so haue you $\frac{6}{105}$ (which being abbreuiated is $\frac{2}{35}$) for your $\frac{2}{3}$ of $\frac{1}{5}$ of $\frac{3}{7}$, as you see in the example.

c.	x.	m.	c.	x.	li.	s.	denar.	
					2		3	parts
					1	of	5	part
					of 3		7	parts
					6			
				1	0	5		

If you will reduce the $\frac{2}{3}$ of $\frac{4}{7}$, and the $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{5}{9}$, you must first reduce each seueral partition into one fraction, by multiplying the numerators together for new numerators, and likewise the denominators for new denominators: as for our $\frac{2}{3}$ of $\frac{4}{7}$, we multiply 4 by 2, maketh 8 for our new numerator. Likewise 7 by 3, maketh 21 for our new denominator; so haue we $\frac{8}{21}$ for our $\frac{2}{3}$ of $\frac{4}{7}$. Then for our $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{5}{9}$, we likewise multiply 1 by 1, and againe by 5, and all maketh but 5 for our numerator; then 2 by 3 maketh 6, and 6 by 9 maketh 54 for our denominator; so haue we $\frac{5}{54}$ for the $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{5}{9}$. And this is a simple fraction.

Now to reduce $\frac{8}{21}$ and $\frac{5}{54}$ into one denomination, follow the order of your first reduction, and you shall finde $\frac{433}{1134}$ for your $\frac{8}{21}$, and $\frac{10}{1134}$ for your $\frac{5}{54}$, and thus must you do with all your partitions before you can bring them to one denomination, which may suffice for your instruction in the second branch of Reduction.

Of Reduction the third branch, nompp.

TO reduce improper fractions into whole numbers, with their distinct fraction, you must obserue the denominator of the improper fraction, by which denominator you must di-

uide the numerator, and if any thing remaine, make that the numerator of your ſimple fraction, as in this example.

If you will reduce $33\frac{3}{4}$ into whole integrums, you muſt ſet them in the ſecond row of your Table, thus: then diuide 33, (your numerator) by 4, (your denominator) and you ſhall find 8, and 1 remaining, which you muſt make the numerator to 4; and ſo haue you 8 vnities, and $\frac{1}{4}$ of a vnitie, as you ſee in the example, and this are you to obſerue in all improper fractions whatſoeuer.

c.	x.	m.	c.	x.	li.	s.	d.
				3	3		4
					8		
					1		4

If you will reduce whole numbers into improper fractions, you muſt conſider into what parts you would reduce them, and by that part, you muſt multiply your whole number, letting the product for numerator, and your multiplier for denominator, ſo ſhall you bring a whole number into an improper fraction, as if you would reduce 26. all into third parts, you muſt multiply 26 by 3, and the product 78 is your numerator, to which ſet 3 your multiplier for denominator; ſo haue you $\frac{78}{3}$ for 26. vnities, and thus of all other. But if your whole number haue a fraction ioyned with it, you muſt multiply your whole number by the denominator of the fraction, and adde the numerator into the product, ſetting the multiplier for denominator, as before.

As if you would reduce $6\frac{3}{5}$ into an improper fraction, you muſt multiply 6 by 5, the denominator of your fraction, the product is 30, to which 30 adde 3, the numerator, then haue you 33 for a new numerator, to which ſet your multiplier 5 for denominator, and then haue you $\frac{33}{5}$ for 6 vnities, and $\frac{3}{5}$ of a vnitie, in which worke and all other of this kind, you muſt obſerue, that the denominator of the fraction ioyned with your whole number, is both your multiplier, and alſo the denominator of the improper fraction.

If you will reduce whole numbers and broken into one denomination, you muſt make of your whole numbers improper fractions, by ſetting one in the place of a denominator to your whole

whole number, as if you reduce 7 integrums, with $3\frac{4}{5}$, and also with $\frac{9}{11}$, you must make your 7 an improper fraction $\frac{7}{1}$ thus: likewise $3\frac{4}{5}$ are $\frac{19}{5}$ thus. having thus made fractions of your whole numbers, set your $\frac{7}{1}$, $\frac{19}{5}$, and $\frac{9}{11}$ in three rowes of your Table, thus. Then multiply all the denominators together, and they make 55 for the generall denominator. Now because 7 (your first numerator) are whole integrums, without more studie multiply 7 by 55, so haue you $\frac{385}{55}$ for your $\frac{7}{1}$; then multiply 19, your second numerator, by 1, and by 11, your first and third denominators: so haue $\frac{209}{55}$ for your $3\frac{4}{5}$ or $\frac{19}{5}$: lastly, multiplie your third numerator by 5, and by 1 your first and second denominators; so haue you $\frac{45}{55}$ for your $\frac{9}{11}$, as in the example; and thus are whole numbers, whole and broken, and also broken, reduced into one denomination.

c.	x.	m.	c.	x.	li.	s.	d.
					7		1
				1	9		5
					9	1	1
				5	5		

The effect were all one, if in this (or the like) worke, you reiected your whole numbers, onely reducing your fractions together, and afterwards multiplie your whole numbers, by the generall denominator to ioyne with them, prouided that you rightly place each product with his owne numerator in an improper fraction, of which take this example.

If you will reduce $9\frac{2}{3}$, $11\frac{5}{7}$, $15\frac{4}{9}$, all into one denomination, put away all your whole numbers, but so, that you obserue to which fraction euery whole number belongeth. Then work with your $\frac{2}{3}$, $\frac{5}{7}$, and $\frac{4}{9}$, as you are taught in the former instruction, so shall you haue $\frac{126}{189}$ for your $\frac{2}{3}$, $\frac{135}{189}$ for your $\frac{5}{7}$, and $\frac{84}{189}$ for your $\frac{4}{9}$.

Now to ioyne your whole numbers with these fractions, you may, if you please, set them whole to their owne fractions, so making $9\frac{126}{189}$ for $9\frac{2}{3}$, also $11\frac{135}{189}$ for $11\frac{5}{7}$, likewise $15\frac{84}{189}$ for $15\frac{4}{9}$, and thus are they all of one denomination. But if your worke require, that they must be all improper fractions, then multiply the generall denominator by each whole number, and adde the product to it owne numerator, as thus, multiply 189 (the

(the generall denominator) by 9, whereof commeth 1701, adde this to the numerator 126, they both make 1827, so haue you $\frac{1827}{189}$ for $9\frac{2}{3}$; likewise multiplie 189 by 11, it giueth 2079, adde this with it owne fraction 135, so haue you $\frac{2214}{189}$ for $11\frac{5}{7}$. Againe, 189 by 15 maketh 2835, which added with 84, maketh $\frac{2919}{189}$ for $15\frac{4}{9}$: and this may suffise for the third branch of Reduction.

Of reduction, the fourth branch.

TO reduce fractions of one kind, or denomination into another kinde or denomination, you must consider into what denomination you would reduce it, whether into thirds, $\frac{1}{4}$ $\frac{1}{8}$ $\frac{1}{10}$ $\frac{1}{20}$ or whatsoeuer: this agreed vpon, you must multiplie the numerator of your fraction by the same denomination, and diuide the product by the former denominator, so shall you reduce a fraction of one kinde into a fraction of another kinde.

Example.

If you will reduce $\frac{3}{4}$ into twelfth parts, you must multiply 3 (the numerator of your fraction) by 12 (the denominator that you would haue), the product is 36; diuide this 36 by 4 (the former denominator), and the quotient is 9 shewing $\frac{9}{12}$ parts, in $\frac{3}{4}$ parts to be contained.

If you would know how many $\frac{5}{7}$ parts are in $\frac{5}{9}$, you must multiply 5 by 9, the product is 45, which diuided by 7, giueth 6 in quotient, that is $\frac{6}{9}$, and 3 remaining, that is $\frac{3}{7}$ of $\frac{1}{9}$. Now to know what $\frac{3}{7}$ of $\frac{1}{9}$ is, you must reduce them, as you are taught, in fractions of fractions, and they are $\frac{3}{63}$; so you see, that $\frac{5}{7}$ are $\frac{6}{9}$ and $\frac{3}{63}$ of an vnitie, and thus of all other in this kinde.

If you would reduce diuers fractions into some different denomination, you must first reduce them vnto one fraction, and then proceede with your former operation *prædicto modo*.

As if you would know how many $\frac{1}{8}$ parts are in $\frac{2}{7}$ and $\frac{4}{9}$, you must first according to your first reduction, reduce $\frac{2}{7}$ and $\frac{4}{9}$ into one denomination, and you shall finde $\frac{18}{63}$ for your $\frac{2}{7}$, and $\frac{28}{63}$ for your $\frac{4}{9}$: now if you adde 18 and 28 (your numerators) together, they both produce $\frac{46}{63}$; then to know how many $\frac{1}{8}$ parts are in $\frac{46}{63}$, multiplie 46 by 8, the product will be 368; di-

uide this by 63, and the quotient giues you 5 13/63, that is 5/8, and 13/63 of 1/8, so many 1/8 parts are in 2/7 and 4/9, and thus must you worke with all other, of what nature soeuer. First, reducing them into one denomination, and then working vpon them, as in these three examples; so we conclude our fourth and last branch of reduction.

Axioma. Multiplicationis.

Multiplication of Fractions.

FRactions being multiplied by fractions, doe beare the same proportion to a Vnitie that whole numbers doe, being multiplied with whole numbers; onely this is the difference, that as the product in whole numbers is greater then either of those, whereof it is produced; so in fractions the product is lesser, then any of those fractions that doe produce it, yet so, that still they beare one, and the same proportion to a Vnitie: for as in whole numbers, the product doth containe, either of the numbers, so often as the other containeth Vnities; so in fractions, the product doth beare the same proportion to either fraction, that the other fraction beareth to a Vnitie, both which are thus prooued.

Multiply 3 by 2, or 2 by 3, the product will be 6, which 6 containeth 3 so often, as 2 containeth Vnities: for there is 2 time 3, in 6: also 6 containeth 2, so often as 3 containeth Vnities, for there is 3 times 2 in 6.

So in fractions, multiplie (the like numbers) 1/2 by 1/3, your product will be 1/6; now 1/6 is in the same proportion to 1/3, that 1/2 is to a Vnitie: for there is 1/6 in 1/3. Likewise 1/6 is in the same proportion to 1/2, that 1/3 is to a Vnitie: for there is 1/6 in 1/2, whereby is prooued, that whole numbers in the increase, and fractions in the decrease, are of like proportion to a vnitie. And thus haue you both their difference and equallitie.

Now to multiplie fractions, either with fractions, whole numbers, or mixt numbers, you must onely obserue to multiply your numerators together, and thereof make a new numerator: likewise multiplie your denominators together, and thereof make a new denominator, and this last fraction shal be the product of your Multiplication, as you shall perceiue by these foure examples.

If

1 If you will multiply $\frac{3}{7}$ by $\frac{4}{9}$, you muſt ſet them in two rowes of your Table, thus: then multiply 4 by 3, they make 12 for your new numerator; likewiſe 9 by 7 maketh 63, for your new denominator; ſo haue you $\frac{12}{63}$, which being abbreuiated is $\frac{4}{21}$, for the product of this Multiplication, and this order you are to obſerue in all other of this nature: where you may note, that this worke is the ſame that you vſed, and muſt vſe in reducing fractions of fractions.

x.	m.	c.	x.	li.	s.	d.
				3		7
				4		9
			1	2		
			6	3		

2 To multiply a fraction by a whole number, or (which is all one) a whole number by a fraction, you muſt onely multiply the numerator of your fraction by your whole number, and ſet the off-com, as numerator to your former denominator for the product of your multiplication; as if you will multiplie $\frac{3}{7}$ by 12, or 12 by $\frac{3}{7}$, ſet them in your Table, thus: then multiplie 3 by 12, or 12 by 3, produceth 36 for a numerator to 5, your former denominator, that is $\frac{36}{7}$, which if you reduce into the proper parts, you will finde $7\frac{1}{7}$ vnities; all which is wrought in the table, without remouing any one figure, as you may ſee in the example.

x.	m.	c.	x.	li.	s.	d.
				3		5
			3	6		
			1	2		
				7	$\frac{1}{7}$	

3 But if the denominator of your fraction may bee euenly diuided by your whole number, then is it better to diuide that denominator by your whole number, and ſet the quotient of that diuiſion in the place of your former denominator, without changing your numerator, as in this example.

If you will multiply $\frac{11}{21}$ by 7, diuide 21 (your denominator) by 7, your quotient will be 3, which 3 ſet as denominator to 11 (your former numerator) and ſo haue you $\frac{11}{3}$ for the product of your Multiplication, in ſtead of $\frac{77}{21}$, which would haue riſen

the other way; and thus may you doe, whensoeuer your denominator, may be euenly diuided by your whole number.

4 To multiplie a mixt number by a fraction, you must first reduce your mixt number into an improper fraction, and then worke as in the former instruction.

If you will multiplie $16\frac{2}{3}$ by $\frac{3}{7}$, you must in the first row of your Table multiplie $16\frac{2}{3}$ all into third parts, and they make $\frac{50}{3}$; then set $\frac{3}{7}$ in the second row, as in this example: this done, multiply 50 by 5, maketh 250 for numerator: likewise 7 by 3 maketh 21 for denominator; so haue you $\frac{250}{21}$ for the product of $16\frac{2}{3}$, multiplied by $\frac{3}{7}$, which product reduced, maketh $11\frac{19}{21}$ vnities. And thus are you to worke, if both your numbers were mixt numbers, first reducing them into improper fractions, and then proceeding, as in these examples; so we conclude Multiplication in fractions.

x.	m.	c.	x.	li.	s.	d.
			5	0	3	
				5	7	
		2	5	0		
			2	1		

Diuision of Fractions.

IN Diuision of whole numbers, we instructed you alwaies to set your Diuidend in the second row of your Table, and your Diuisor in the first: but in Fractions wee aduise you (the contrarie) to set your Diuidend in the first row, and your Diuisor in the second row of your Table, both because your Diuidend requires to be first placed, and also in the conclusion of your worke, you will finde them to stand orderly as a fraction should doe, with the numerator aboue the denominator, whereby you shall be in no danger of mistaking. Hauing thus orderly placed them, you must multiply crosse-wise the numerator of your diuidend, by the denominator of your diuisor, and that product is the numerator of your quotient: likewise multiplie the numerator of your diuisor by the denominator of your diuidend, and this product is the denominator of your quotient, both which you may doe by your Table, without changing

changing rankes, or remouing figures, as you may perceiue by the examples.

If you will diuide $\frac{3}{7}$ by $\frac{4}{5}$, set your diuidend $\frac{3}{7}$ in the first row, and your diuisor $\frac{4}{5}$ in the second row of your Table, thus: then multiplie 3, the numerator of your diuidend, by 5 the denominator of your diuisor, so haue you 15 for your numerator. Also, multiply 4 the numerator of your diuisor, by 7 the denominator of your diuidend, so haue you 28 for your denominator, and thus $\frac{15}{28}$ is the quotient of $\frac{3}{7}$, diuided by $\frac{4}{5}$, as in the example. But if in this example, you had diuided $\frac{4}{5}$ by $\frac{3}{7}$, then in vsing the same order you would haue found $\frac{28}{15}$ for your quotient, wherein you may easily mistake your numerator for your denominator, if you doe not obserue a due methode of placing your diuidend and diuisor, as you may see by the difference. And this order and worke are you to obserue in the Diuision of fractions by fractions, of what kinde soeuer.

x.	m.	c.	x.	li.	s.	d.
				3		7
			1	5		
				4		5
			2	8		

To diuide a whole number, by a fraction, you must onely multiplie your whole number by the denominator of your fraction, and that product shall be the numerator of your quotient, and the former numerator shall bee the denominator of your quotient; as if you would diuide 13. by $\frac{7}{9}$ you must set them (as before) thus: then multiplie 13 by 9, and your quotient standeth $\frac{117}{7}$: now to reduce this improper fraction into his proper termes, set the same numerator again, in the third row of your table, diuide it by 7, and set the quotient, as it riseth in the fourth row of your Table, so shal you haue $16\frac{5}{7}$, as you see in the example.

x.	m.	c.	x.	li.	s.	d.
			1	3		1
		1	1	7		7
				7		9
			4	5		
		X	X	7		7
			1	6		

Also if you will diuide the same fraction by the same whole number, thus $\frac{7}{9}$ per 13. you must set 13. in the first row, and 1 in the second row, and worke as before, so shall you haue $\frac{1}{117}$ for your quotient.

number, then multiply the whole number by the denominator of the fraction, and set that product for denominator to the former numerator, as in this example, and so haue you $\frac{7}{117}$ for your quotient; and thus may you worke in all whole numbers, diuided by fractions, or all fractions diuided by whole numbers. But in this latter worke, if it happen that your whole number may euenly diuide the numerator of your fraction, then by the same whole number, diuide the said numerator, without changing your denominator, and so shall you expresse your quotient briefer, and in lesser termes; as if you will diuide $\frac{18}{21}$ by 6, you see that 6 will euenly diuide 18, and the quotient will be 3, which 3 set as numerator to 21, so haue you $\frac{3}{21}$, or $\frac{1}{7}$ for the quotient of $\frac{18}{21}$, diuided by 6. And thus may you doe with any other, whose numerator may be euenly diuided by your whole number.

x.	m.	c.	x.	li.	s.	d.
				7		9
			1	3		1
				7		
		1	1	7		

If you will diuide mixt numbers by fractions, or by mixt numbers, you must first reduce your mixt numbers into improper fractions, and then worke, as in the precedent questions; as if you would diuide $9\frac{2}{3}$ by $\frac{5}{8}$, you must in the first row of your Table reduce $9\frac{2}{3}$ into thirds, and they make $\frac{29}{3}$ for your diuidend, then set $\frac{5}{8}$ your diuisor in the second row, thus. Now worke as before, so shall you haue $\frac{232}{15}$ for your quotient, which being reduced, as you are taught to reduce improper fractions, giueth $15\frac{7}{15}$ vnities: but if you diuided $\frac{5}{8}$ by $\frac{29}{3}$, you would then find $\frac{15}{232}$, as you perceiued by the former example of this nature. And thus must you doe, if you diuide mixt numbers by mixt numbers, first, reducing them into improper fractions, & then working according to this operation.

x.	m.	c.	x.	li.	s.	d.
			2	9		3
				5		8
		2	3	2		
			1	5		

Fractionem priùs & propriam, & è contra. But

But if it happen that your denominators be like numbers, then set your diuidend in the first row, and your diuisor in the second row of your Table. Now to finde your quotient, cell both your denominators, and your diuision is ended, because the numerator of your diuisor, is an apt denominator for the numerator of your diuidend, as if you diuide $\frac{9}{13}$ by $\frac{5}{13}$, set these two numbers, in your table, thus, then cancel both your denominators, and your quotient is $\frac{9}{5}$, as in the example, and thus of all other, whose denominators are like numbers. *As in these fractions* $\frac{9}{13}$ *per* $\frac{5}{13}$.

x.	m.	c.	x.	li.	s.	d.
				9	x	z
				5	x	z

Finally, if the numerator of your diuidend, may euenly diuide the numerator of your diuisor by the quotient of that diuision, multiply the denominator of your diuidend, and this will be an apt denominator for your quotient; then for a numerator, set your other denominator. Or if the numerator of your diuisor may euenly diuide the numerator of your diuidend by that quotient, multiply the denominator of your diuisor, and this product shall be an apt numerator for your quotient to the denominator of your diuidend. As if you would diuide $\frac{15}{19}$ by $\frac{5}{7}$ you see that 5 will diuide 15, and the quotient will be 3, by which 3 multiplie 7, the denominator of your diuisor, so haue you 21 for your numerator, to which set 19, the denominator of your diuidend for denominator, and your whole quotient will be $\frac{21}{19}$. Or if you will diuide $\frac{5}{7}$ by $\frac{13}{15}$, vsing the method of the first instruction, you will find $\frac{19}{21}$ for your quotient. And thus of all other, whose numerators may one euenly diuide the other. *Those first numbers where Compositi*

Now to mediate or diuide by 2, by 3 4 5, or any other, is taught in the diuiding a fraction by a whole number, wherfore we here conclude Diuision.

Addition of Fractions.

ADdition of fractions will be very easie, if you remember your former workes of Reduction: for if your denominators be like numbers, you haue no more to doe, but adde their numerators together, whether they be 2, or more numerators, and the totall of these shall be the numerator to your generall denominator: as if you would adde $\frac{12}{15}$ with $\frac{13}{15}$, here the denominators being like numbers, there needeth no other worke, but onely adde the numerators 12 and 16 together; so haue you $\frac{28}{15}$, which being reduced into the distinct termes, giueth $1\frac{3}{15}$ for your totall.

But if your denominators be diuers and different, you must reduce them into one denomination, as you are taught in the first part of Reduction, wherefore we will take one of the same questions for our example.

If you will adde $\frac{3}{5}$, $\frac{5}{9}$, and $\frac{4}{7}$ together, the second question in Reduction shewes you how to reduce them into one denomination, where you find 315 for your generall denominator; then for your $\frac{3}{5}$ you haue $\frac{189}{315}$, for your $\frac{5}{9}$ you haue $\frac{175}{315}$, and for your $\frac{4}{7}$ you haue $\frac{180}{315}$. Now if you adde all the numerators together, that is 189, 175, & 180, they make 544, which set as numerator to the generall denominator, maketh $\frac{544}{315}$ for the totall of your Addition. And thus are you to doe in all other additions of fractions, after you haue reduced them into one denomination.

But if you haue many fractions to bee added together, as $\frac{3}{7}$, $\frac{5}{11}$, $\frac{4}{9}$, $\frac{5}{10}$, and $\frac{8}{11}$, you must first reduce each two fractions seuerally, as first $\frac{3}{7}$ and $\frac{5}{11}$ make $\frac{17}{12}$; then $\frac{5}{11}$ and $\frac{4}{9}$ make $\frac{71}{99}$. Againe $\frac{5}{10}$ and $\frac{8}{11}$ make $\frac{146}{110}$, which being abbreuiated is $\frac{73}{55}$: so that now in stead of your former 6, you haue these 3 fractions, $\frac{17}{12}$, $\frac{71}{99}$, and $\frac{73}{55}$; therefore againe reduce these into one denomination, and you shall finde $\frac{18095}{65340}$, $\frac{48180}{65340}$, and $\frac{86388}{65340}$, for your $\frac{17}{12}$, $\frac{71}{99}$, and $\frac{73}{55}$. And these 3 will orderly stand in 3 rowes of your Table, with the generall denominator in the fourth row; whereby you may adde them into any one ranck for a numerator to the said denominator, and they make $\frac{153173}{65340}$ for the totall of your Addition.

on. Of which totall, if you deſire to know the diſtinct termes, diuide the numerator by the denominator, as is taught in reduction of improper fractions, and you ſhall finde $3\ \frac{37533}{41580}$: which fraction, if you allow your addition in money, is 18 s. $\frac{37}{691}$, and thus your totall will be 3 li. 18 s. $\frac{37}{691}$. But if you will haue it in any other thing, as yardes, elles, or ſuch like, then is that fraction $\frac{9}{10}$, and $\frac{37}{1382}$ of $\frac{1}{10}$; ſo that your totall will then be, $3\ \frac{9}{10}$ and $\frac{37}{1382}$ of $\frac{1}{10}$. And this may ſuffiſe for Addition in fractions, conſidering that all Additions, wherein fractions haue any being, whither proper, improper, or fractions of fractions, requires onely the addition of their numerators, after their reduction into one denomination.

Subtraction of Fractions.

AS in the former worke of Addition, if your denominators be like numbers, you muſt onely adde the numerators together to produce your totall; ſo in this worke of Subtraction, if your denominators be like numbers, you muſt onely ſubtract the leſſer numerator from the greater, and the remaines muſt bee the numerator to your generall denominator: as if you would ſubtract $\frac{1}{9}$ from $\frac{8}{9}$, the remaines will be $\frac{7}{9}$, or $\frac{1}{1}$. Likewiſe if you ſubtract $\frac{8}{15}$ from $\frac{11}{15}$, the remaines will bee $\frac{3}{15}$, or $\frac{1}{5}$: and thus of all other of like denomination.

But if your denominators be vnlike numbers, you muſt then reduce them into one denomination, and vſe the former operation, as if you would ſubtract $\frac{5}{7}$ from $\frac{12}{13}$, you ſhall finde $\frac{65}{91}$ for your $\frac{5}{7}$, and $\frac{84}{91}$ for your $\frac{12}{13}$. Now if you ſubtract 65 from 84, you haue $\frac{19}{91}$ for your remaines. If you haue many fractions to ſubtract from one ſimple fraction, or from many other fractions, obſerue theſe two examples.

To ſubtract $\frac{1}{4}$ and $\frac{2}{7}$ from $\frac{8}{9}$, you muſt reduce all theſe together into one denomination, and you ſhall finde $\frac{63}{252}$ for your $\frac{1}{4}$, and $\frac{72}{252}$ for your $\frac{2}{7}$, and $\frac{224}{252}$ for your $\frac{8}{9}$. Now if you adde 63 with 72, the numerators of your $\frac{1}{4}$ and $\frac{2}{7}$ that are to be ſubtracted, you will haue

	x.	m.	c.	x.	li.	s.	d.
					x		4
				6	3		
					x		7
				7	2		
					8		9
			2	2	4		
			2	5	2		

135, which being ſubtracted from 224, the numerator of your $\frac{8}{9}$, leaueth remaining $\frac{89}{252}$ for the ſolution of your queſtion.

Againe, if you will ſubtract $\frac{3}{8}$, and $\frac{2}{9}$ from $\frac{3}{4}$ and $\frac{3}{7}$, you may (if you pleaſe) reduce each partition into one fraction; and then againe reduce thoſe two fractions into one denomination, vſing the former operation; but wee hold it better, briefer and eaher to reduce them altogether into one denomination; ſetting them in order in foure rowes of your Table, thus: then multiplie all your denominators together, and ſhall make 504 for your generall denominator. Now to finde each fractions numerator, multiplie each numerator by al the denominators (except it owne) as you are taught in reduction, and you ſhall finde $\frac{167}{1512}$ for your $\frac{3}{8}$, and $\frac{336}{1512}$ for your $\frac{2}{9}$: ſo that adding theſe 2 together, maketh $\frac{903}{1512}$ for the number to bee ſubtracted. Again, you haue $\frac{1008}{1512}$ for your $\frac{3}{4}$, and $\frac{648}{1512}$ for your $\frac{3}{7}$: now if you adde 1008 and 648 togeather, then haue you $\frac{1656}{1512}$ for $\frac{3}{4}$ and $\frac{3}{7}$, from which ſubtract 903 your other numerator, and ſo haue you $\frac{753}{1512}$ for the anſwere of your queſtion, and thus may you doe with all other of this nature, obſeruing that you muſt alwaies ſubtract a leſſer number from a greater: for a greater from a leſſer cannot bee ſubtracted.

x.	m.	c.	x.	li.	s.	d.
				3		8
		5	6	7		
		3	3	6		
				2		3
	1	0	0	8		
				3		7
		6	4	8		
	1	5	1	2		

To conclude, if you bee to ſubtract a fraction from a whole number, you may either reduce the whole number into an improper fraction of the ſame denomination, or (which is better) take one, or ſo many of the whole number, as may counterpaile your fraction: as if you will ſubtract $\frac{4}{9}$ from 5 vnities, take 1 of your vnities, and thereof make $\frac{9}{9}$, from which ſubtract $\frac{4}{9}$, the remaines are $4\frac{5}{9}$: likewiſe if you ſubtract $2\frac{3}{7}$ from 4, you firſt muſt

must allow your 4, as $3\frac{1}{3}$ thus; then ſubtract $2\frac{1}{3}$ from $3\frac{1}{3}$, and the remaines is $1\frac{1}{3}$.

Finally, if you ſubtract $16\frac{1}{8}$ from $23\frac{2}{7}$, or any ſuch like, ſee by your whole numbers, and reduce your fractions into one denomination; ſo ſhall you haue $\frac{14}{56}$ for your $\frac{1}{8}$, and $\frac{16}{56}$ for your $\frac{2}{7}$. Now place theſe with your whole numbers, and you haue $16\frac{14}{56}$ to ſubtract from $23\frac{16}{56}$, which being ſubtracted according to your former inſtruction, leaueth $6\frac{2}{56}$ remaining. And thus haue you ſufficient diuerſitie for your inſtruction of Subtraction.

The Rule of three in Fractions.

HAuing (in the workes aforegoing) ſufficiently inſtructed the Rule of 3 in whole numbers, it is now conuenient that we appropriate our Table to the working of the ſame rule in fractions, or broken numbers. And firſt of the Direct, or forward Rule of 3, wherein you are to obſerue for a generall rule, that you multiplie the numerator of your firſt fraction, by the denominator of your ſecond fraction; and againe, by the denominator of your third fraction, the product of which multiplication ſhall be your diuiſor. This done, multiplie the numerator of your ſecond fraction, by the denominator of your firſt, and againe by the numerator of your third, and this product ſhall be your diuidend. Laſtly, diuide your diuidend by your diuiſer, and the quotient giues your forth proportionall, which is the anſwere of your queſtion; all which you ſhall plainely perceiue to be both eaſie, briefe and certaine by theſe following examgles.

If $\frac{2}{7}$ yard of ſatten coſt me $\frac{3}{9}$ of a pound, or 20 s., what ſhall I pay for $\frac{7}{9}$ after that rate; ſet your $\frac{2}{7}$, $\frac{3}{9}$, and $\frac{7}{9}$ in 3 rowes of your Table thus: then multiply 2, the numerator of your firſt fraction by 7, the denominator of your ſecond, maketh 14, which 14 multiplie againe by 9, your third denominator 14 [illegible]

x.	m.	e.	x.	li.	s.	d.
				2		5
		1	2	6		
				3		7
		1	0	5		
				7		9
				5		6

minator, it giueth 126 for your diuisor: then multiply 3, (the numerator of your second fraction) by 5, the denominator of your first, it maketh 15, which 15 multiply by 7, the numerator of your third fraction, and the product will bee 105 for your diuidend. Now to diuide 105 by 126, you cannot, therefore abbreuiate them, and you will haue $\frac{5}{6}$ for the answere of your question, as in the example.

x.	m.	c.	x.	li.	s.	d.
				7		9
		2	1	0		
				5		6
			9	0		
				2		5
				3		7

For the proofe of this question, or any such like, propound the same question backward, as thus; If $\frac{7}{9}$ of a yard cost $\frac{5}{6}$ of a pound or 20 s, what must bee paid for $\frac{2}{7}$, set numbers thus: then multiplie and diuide, as in the former instruction, and you shall finde $\frac{5}{7}$ as before.

Or thus, if you multiplie the two extremes, that is $\frac{2}{7}$ and $\frac{5}{6}$ the first and the last numbers together, your product will be $\frac{5}{21}$. Also multiplie your two meanes, $\frac{1}{3}$ and $\frac{7}{9}$ together, and they likewise make $\frac{7}{27}$, these two thus agreeing, is a most certaine proofe that you haue truly wrought it.

If $\frac{4}{7}$ of an elle, cost me $\frac{5}{7}$ of a pound, what must bee paied for 12 $\frac{1}{4}$ elles? put your whole number into broken, and you shall haue $\frac{12}{1}$; then set $\frac{4}{7}$, $\frac{5}{7}$, and $\frac{49}{4}$ in three rowes of your Table, thus. This done, multiply 4 (your first numerator) by 7, and by 4, your second and third denominators; so haue you 112 for your deuisor. Againe, multiplie 5, (your second numerator) by 5 your first denominator, & by 51 your third numerator, so haue you 1530 for your diuidend. Lastly, diuide 1530 by 112, and your quotient giues you 13 li $\frac{27}{56}$, which fraction is worth 13 s. 2 d, $\frac{4}{7}$, so much must be paied for 12 $\frac{1}{4}$ elles, if $\frac{4}{7}$ of one elle cost $\frac{5}{7}$ of a pound or 20 s.

x.	m.	c.	x.	li.	s.	d.
				4		5
		1	1	2		
				6		7
	1	5	3	0		
			5	4		4
			1	3	$\frac{27}{56}$	

If

If $\frac{7}{8}$ of a yard of Veluet coſt me 15 s. 10 d.; what muſt I pay for 157 $\frac{3}{5}$ yards at that rate? conſider that 10 d. is $\frac{5}{6}$ of a ſhilling, therefore put your 15 s. 10 d. into ſixth parts, and you ſhall haue $\frac{95}{6}$: likewiſe put your other whole number 157 $\frac{3}{5}$ into his broken, and you haue $\frac{473}{3}$: being thus reduced, ſet your $\frac{7}{8}$, $\frac{95}{6}$, and $\frac{473}{3}$ in 3 rowes of your Table, thus. Then as hath been taught, multiplie your firſt numerator by the other 2 denominators, and ſo haue you 126 for your diuiſor. Likewiſe multiplie your ſecond numerator by your firſt denominator, and laſt numerator, ſo haue you 359480 for your diuidend, which being diuided by 126, giueth in quotient 285 $\frac{5}{63}$ s.; that is 142 li. 13 s. $\frac{5}{63}$: where you perceiue, that ſuch as your middle number is, will your fourth number be, as here your middle number was ſhillings, and parts of ſhillings, and therefore your quotient brought foorth ſhillings: but if you would haue had pounds at one diuiſion, it had been but multiplying your diuiſor by 20, and then to haue diuided your diuidend by that diuiſor, had produced pounds at one diuiſion, and the like aduantage may you many times take both for ſhillings pence, and many other values.

c.	x.	m.	c.	x.	li.	s.	d.
					7		8
			1	2	6		
				9	5		6
3	5	9	4	8	0		
			4	7	3		3
		2	8	5	3	$\frac{5}{63}$	
			1	4	2	13	$\frac{5}{63}$

If 25 $\frac{3}{4}$ elles coſt me 16 li. $\frac{2}{3}$, how many elles muſt be had for 79 li. $\frac{5}{9}$? here you ſee your firſt and third numbers are of contrary denomination, therfore in your diſcretion, you muſt make thoſe that are of one denomination, your firſt and third numbers, by varrying your poſition thus, If 16 li. $\frac{2}{3}$ doe buy me 25 $\frac{3}{4}$ elles, how many elles ſhall 79 li. $\frac{5}{9}$ buy

x.	m.	c.	x.	li.	s.	d.
			5	0		3
		1	2	9		5
		7	1	6		9
		1	2	3	$\frac{19}{135}$	

me. Put your whole numbers into broken, and you shall haue $\frac{16}{1}$, $\frac{229}{1}$, and $\frac{71\frac{1}{2}}{1}$, set these in three rowes of your Table as in the example aforegoing: then multiply as in the former examples, and you shall haue 2250 for your diuisor, and 277092 for your diuidend, these being diuided the one by the other, giueth in quotient $123\frac{342}{2250}$, which being abbreuiated, maketh $\frac{19}{125}$: so the answere is, that if $16\frac{2}{3}$ li. doe buy $25\frac{4}{5}$ elles, then $79\frac{1}{2}$ li. will buy $123\frac{19}{125}$ elles.

These examples may suffise for the Direct or forward rule of 3, considering wee are to vse the same almost in all the succeeding Arts of Arithmetick, therefore we will now shew you the Reuerse or Backward Rule in fractions.

The Reuerse, or Backward Rule of 3 in Fractions.

WE haue shewed you in the workes of whole numbers, that it is called the Reuerse, or backer Rule of 3, when more requires lesse, and lesse requires more, that is, when the Antecedent being great, or small, requires a contrary consequent; as also that the same number which is your multiplier in the direct or forward Rule of 3, is your diuisor in the Reuerse or backward Rule of 3. And the same reasons in euerie respect) holdeth good in fractions: for as in the Direct Rule of 3, (next aforegoing) the numerator of the first fraction is multiplied by the denominators of the second and third fractions to make your diuisor; and likewise the denominator of the said first fraction by the second and third numerators for your diuidend: so in the Reuerse or backer Rule of 3, you must on the contrary multiplie the numerator of your third fraction by the denominators of your first and second fractions for your Diuisor, and againe the denominator of your said third fraction by your first and second numerators for your diuidend. And this is the whole reason whereupon this Rule is grounded.

But for the fit and apt appropriation of this Rule to bee wrought by our Table, obserue this instruction; first, set your numbers orderly in three rowes of your Table. Then multiplie your second numerator by your first numerator, and that

product

product by your third denominator, and this shall bee your dividend: that done, multiplie your first denominator by your second denominator, and againe by your third numerator, and this product shall bee your diuisor. Lastly, diuide your diuidend by your diuisor, and the quotient giues your fourth proportionall for the answere of your question, which these following examples will plainely manifest.

When the bushell of wheate cost 5 s. 4 d., suppose the penny white loafe to weigh 11 $\frac{1}{2}$ ounces, I demand what the same penny loafe should weigh, when the bushell of wheate cost but 4 s. 2 d. Reason willeth, that the lesse the wheate cost, the more the loafe should waigh, therefore put your whole numbers into their broken, and you shall haue $\frac{1}{3}$ of a shilling for your 5 s. 4 d.; $\frac{23}{2}$ ounces for your 11 $\frac{1}{2}$; and $\frac{25}{6}$ of a shilling for your 4 s. 2 d. These three fractions $\frac{16}{3}$, $\frac{23}{2}$, and $\frac{25}{6}$ set in three rowes of your Table, thus. Then multiply the second numerator 23, by the first numerator 16, and you produce 368, which 368 multiply againe by your third denominator 6, so haue you 2208 for your diuidend. This done, multiplie your first denominator 3, by your second denominator 2, maketh 6, and againe by your third numerator 25 produceth 150 for your diuisor. Lastly, diuide 2208 by 150, and the quotient giues you 14 $\frac{108}{150}$ for your fourth proportionall, so many ounces must the penny loafe waigh, when the bushell of wheate cost but 4 s. 2 d., which is the question demanded.

x.	m.	c.	x.	li.	s.	d.
			1	6		3
			2	3		2
			2	5		6

A Grocer hath bought Cloues at 6 s. 3 d. the pound, and affordeth mee 7 $\frac{1}{3}$ ounces for 3 s., the question is, how many ounces he might haue afforded for the same 3 s., if himself had paied 8 s. 2 d. for the pound? Answere, If $\frac{25}{4}$ shillings giue $\frac{220}{3}$ ounces, what shall $\frac{49}{6}$ shillings giue: set your $\frac{25}{4}$, $\frac{22}{3}$, and $\frac{49}{6}$ in three rowes of your Table, as in the example following. Then multiplie 22 your second numerator, by 25 your first numerator,

tor, and again by 6, your third denominator, so haue you 3300 for your diuidend: then multiplie 4, your first, by 3 your second denominator, and againe by 49, your third numerator; so haue you 588 for your diuisor. Lastly, diuide 3300 by 588, and your quotient giues you $5\frac{10}{49}$ for your fourth proportionall, so many ounces should you haue had for your 3 s., if the Grocer had paied 8 s. 2 d. for the pound.

x.	m.	c.	x.	li.	s.	d.
			2	5		4
			2	2		3
			4	9		6

A friend of mine did lend me $\frac{8}{9}$ of a pound, which I paid him at the end of 5 moneths; afterwards he borrowed of me $\frac{7}{12}$ of a pound, the question is, how long hee may vse my money to requite his former courtesie? make your 5 moneths an improper fraction, by setting 1 as a denominator to 5, so shall you haue $\frac{8}{9}$, $\frac{5}{1}$, and $\frac{7}{12}$ to set in 3 rowes of your table thus: then multiplie and diuide, as in the former instruction, and you shall finde $7\frac{13}{21}$, so many moneths may hee lawfully keepe my money.

x.	m.	c.	x.	li.	s.	d.
				8		9
				5		1
				7	1	2

I haue bought $5\frac{3}{7}$ yards of broad Cloth of 6 quarters and a halfe broad, and I would line the same with Bayes of $\frac{1}{4}$ broad, the question is, how many yards of the same Bayes will line my $5\frac{3}{7}$ yards of broad cloth. To worke this (or any such like) first put your $5\frac{3}{7}$ into one fraction, and they make $\frac{38}{7}$: likewise your $6\frac{1}{2}$ quarter into 8 parts, maketh $\frac{13}{2}$: this done, set your $\frac{38}{7}$, $\frac{13}{2}$, and $\frac{1}{4}$, in three rowes of your Table, thus. Then say, if $\frac{38}{7}$ doe giue $\frac{13}{2}$, what shall $\frac{1}{4}$ giue, multiply and diuide

x.	m.	c.	x.	li.	s.	d.
			1	7		3
			1	3		8
				3		4

diuide as you are formerly taught, and you ſhall finde 12 $\frac{1}{10}$ ſo many yards of bayes will line my 5 $\frac{3}{5}$ yardes of broad Cloth.

More, I haue 7 $\frac{1}{2}$ yards of Veluet $\frac{1}{3}$ in bredth, with which I would line a cloke of cloth 7 quarters broad, I demand how many yards of the ſame cloth my Veluet will line? Anſwere by the Rule reuerſe, if $\frac{1}{2}$ giue $\frac{1}{10}$ what will $\frac{7}{4}$ giue: multiply and diuide, and you ſhal find 2 $\frac{19}{21}$, which fraction is $\frac{1}{3}$, and $\frac{1}{7}$ of $\frac{1}{10}$ ſo many yards of cloth will the ſaid veluet line.

Againe, I had 9 $\frac{1}{2}$ elles of yard-broad Polldauis, with which I lined 6 $\frac{3}{4}$ elles of Orras, I demand what breadth the ſame Orras did beare? Anſwere, if $\frac{2}{3}$ in length giue $\frac{4}{5}$ in breadth, what ſhall $\frac{27}{28}$ in length giue; multiplie and diuide, and you ſhall find the breadth of your Orras to be 1 $\frac{17}{135}$ elle; which fraction is $\frac{1}{8}$ and $\frac{1}{135}$ of $\frac{1}{8}$. And theſe examples may ſuffiſe for your inſtruction in the Reuerſe or Backer Rule of 3 in fractions.

The Double Rule of 3 in Fractions.

BEing vnderſtood in the Direct, and alſo in the backer rule of 3 in fractions, there needeth little explanation of this Double Rule of 3; conſidering it is none other then a twofold working vpon their operations: wherein you are firſt to obſerue, (as in whole numbers) that both in the firſt and ſecond operations your firſt and third numbers muſt bee of one denomination. And ſecondly, that the fourth proportionall of your firſt worke, is alwaies the ſecond number in your ſecond worke: and this is all you are to remember and obſerue in this double rule of 3 in fractions.

Example.

If $\frac{7}{8}$ of a Porteguiſe in $\frac{9}{10}$ of a yeere doe gaine $\frac{5}{6}$ of a pound, I demand what $\frac{4}{5}$ of a Porteguiſe ſhall gaine in $\frac{3}{4}$ of a yeere $\frac{7}{8}\ \frac{9}{10}\ \frac{5}{6}\ \frac{4}{5}\ \frac{3}{4}$.

Here you ſee, that $\frac{7}{8}$ and $\frac{4}{5}$ are of one denomination: likewiſe $\frac{9}{10}$ and $\frac{3}{4}$ are of one denomination, and $\frac{5}{6}$ is the ſecond number to either of them; ſo that it is indifferent which two you begin withall, but for orders ſake it is alwaies good to begin with the firſt, therefore ſay, if $\frac{7}{8}$ doe gaine $\frac{5}{6}$ what ſhall $\frac{4}{5}$ gaine; ſet your $\frac{7}{8}\ \frac{5}{6}$ and

$\frac{7}{10}$, $\frac{5}{6}$, and $\frac{4}{5}$ in three rows of your Table, thus. Then multiplie and diuide as you are taught in the direct Rule of 3, and you shall find $\frac{16}{21}$ for the fourth proportionall of your first worke: this done, say againe,

x.	m.	c.	x.	li.	s.	d.
				7		8
				5		6
				4		5
			1	6	2	1

If $\frac{9}{10}$ doe giue $\frac{16}{21}$, what shall $\frac{3}{4}$ giue; set your numbers in your Table thus; multiplie and diuide as before, and you shall finde $\frac{40}{63}$, so much shall $\frac{4}{7}$ of a Porteguise gaine in $\frac{3}{4}$ of a yeere after the rate of this position.

x.	m.	c.	x.	li.	s.	d.
				9	1	0
			1	6	2	1
				3		4
			4	0	6	3

If $\frac{4}{7}$ of a Porteguise in $\frac{3}{4}$ of a yeare do gaine $\frac{40}{63}$ of a pound, in what time shall $\frac{7}{8}$ of a Porteguise gaine $\frac{5}{6}$ of a pound: $\frac{4}{7}$, $\frac{3}{4}$, $\frac{40}{63}$, $\frac{7}{8}$, $\frac{5}{6}$, say by the Rule Reuerse, if $\frac{4}{7}$ require $\frac{3}{4}$, what shall $\frac{7}{8}$ require? set your $\frac{4}{7}$, $\frac{3}{4}$, and $\frac{7}{8}$ in 3 rowes of your Table, thus: then multiplie and diuide according to the Backer rule of 3, and you shall finde $\frac{24}{32}$: then say againe; If $\frac{40}{63}$ require $\frac{24}{32}$, what shall $\frac{5}{6}$ require? set your $\frac{40}{63}$, $\frac{24}{32}$, and $\frac{5}{6}$ in three rowes of your Table, thus: then multiplie and diuide, as you are taught in the Direct Rule of 3, and you shal finde $\frac{720}{840}$, which being abbreuiated, is $\frac{9}{10}$ answerable to the first position; whereby you perceiue the truth of both workings, each being a proofe of other, and also the difference betweene the Forward, and Backward Rule of double positions.

x.	m.	c.	x.	li.	s.	d.
				4		5
				3		4
				7		8
			2	4	3	5

x.	m.	c.	x.	li.	s.	d.
			4	0	6	3
			2	4	3	5
				5		6
				9	1	0

A Merchant hath boughs Satten at 12 s. 6 d. the yard readie money, which he selleth againe for 13 s. 8 d. the yard, to be paid for at the ende of 3 ½ moneths; the question is, what he gaineth in the 100 li. for 12 moneths after that rate? first subtract 12 s. 6 d. from 13 s. 8 d. & the remaines are 1 s. 2 d., that is $\frac{7}{6}$ of a shilling; then put 12 s. 6 d. into the parts of a shilling, and you shal haue $\frac{25}{2}$; this done, say, If $\frac{25}{2}$ doe gaine $\frac{7}{6}$, what shall $\frac{100}{1}$ gaine? let your $\frac{25}{2}$, $\frac{7}{6}$, and $\frac{100}{1}$ in three rowes of your Table, thus; then multiplie and diuide, as in the Direct Rule of 3, and you shal finde 9 $\frac{1}{3}$, which is $\frac{28}{3}$: then say againe, If $\frac{7}{2}$ moneths doe gaine $\frac{28}{3}$, what shall $\frac{12}{1}$ gaine? multiplie and diuide, and you shall find 32 li., so much shal the said Merchant gaine vpon the 100 li. in 12 moneths, after the rate aforesaid.

x.	m.	c.	x.	li.	s.	d.
			2	5		2
				7		6
		1	0	0		1
				9	1/3	

x.	m.	c.	x.	li.	s.	d.
				7		2
			2	8		3
			1	2		1
			3	2		

If 100 li. in 12 moneths doe gaine 32 li., in what time shall 12 s. 6 d. gaine 1 s. 2 d.? put your whole numbers into broken, and you shall haue $\frac{1200}{1}$ li., $\frac{32}{1}$ moneths, $\frac{12}{1}$ li., $\frac{25}{2}$ s., and $\frac{7}{6}$ s.; then say, If $\frac{1200}{1}$ require $\frac{32}{1}$, what shall $\frac{25}{2}$ require; set your numbers thus; then multiplie and diuide by the Rule Reuerse, and you shal find 96: then say againe, If $\frac{12}{1}$ require $\frac{96}{1}$, what shall $\frac{7}{6}$ require? place your numbers thus, and worke according to the Direct Rule of 3, and you shall finde 3 ½

x.	m.	c.	x.	li.	s.	d.
		1	0	0		1
			1	2		1
			2	5		2
			9	6		

x.	m.	c.	x.	li.	s.	d.
			3	2		1
			9	6		1
				7		6
				3	2/3	

moneths, as before, which is a certaine prooſe of both workings. And thus haue we giuen you ſeuerall examples forward and backward, both in fractions, and fractions ioyned with whole numbers; which (conſidering we are to handle the like Rules hereafter in loſſe and gaine) we hold at this time ſufficient for your inſtruction.

The Rule of three compoſed both in whole numbers and fractions.

THe firſt and ſecond partes of the Rule of three compoſed, differeth nothing in the poſition from the double Rule of three aforegoing, onely the worke is ſomewhat briefer, in regard this Rule requireth but one Diuiſion, and the other two for the ſolution of your queſtion: but in both theſe parts, you muſt duly obſerue the right placing of your numbers; to doe which in this firſt parte, marke this inſtruction: firſt, place the materiall ſubſtance of your queſtion, as money, men, or ſuch like. In the ſecond, place the time. In the third, place the thing done; then the fourth muſt be like the firſt, and the fifth muſt be of the ſame denomination with the ſecond. As thus, If 15 li. (there is the ſubſtance of your queſtion) in 6 moneths (there is the time) doe gaine 9 Crownes (there is the thing done), what ſhall 8 li. gaine (there is the match-terme of your firſt) in 4 moneths (there is the ſame denomination of your ſecond number)? Being thus placed, you muſt alwaies (in this firſt part) multiplie the firſt number by the ſecond, and the product thereof ſhall be your diuiſor: then multiplie the other three numbers one into the other, and their product ſhall bee your diuidend, the quotient of which diuiſion ſhall be the ſolution of your queſtion: as if you take the ſame numbers, your poſition will bee thus, if 15 li. in 6 moneths doe gaine 9 Crownes, what ſhal 8 li. gaine in 4 moneths? 15. 6. 9. 8. 4. place your numbers in your Table, thus: then (in the firſt row) multiplie 15 by 6, it

x.	m.	c.	x.	li.	s.	d.
			1	5		
				6		
				9		
				8		
				4		

produceth

produceth 90 for your diuiſor; in the ſecond row, multiply 9 by 8, and againe by 4, ſo haue you 288 for you diuidend. Laſtly, diuide 288 by 90, and the quotient giues you $3\frac{1}{5}$: ſo many Crownes ſhall 8 li. gaine in foure moneths, if 15 li. gaine 9 Crownes in 6 moneths.

If $\frac{5}{6}$ of a li. in $\frac{3}{4}$ of a moneth do gaine $\frac{7}{8}$ of a ſhilling, what ſhall $\frac{3}{5}$ of a li. gaine in $\frac{2}{3}$ of a moneth? $\frac{5}{6}.\frac{3}{4}.\frac{7}{8}.\frac{3}{5}.\frac{2}{3}.$, place your numbers in your Table, thus: then multiplie $\frac{5}{6}$ by $\frac{3}{4}$, and your product will be $\frac{5}{8}$ for your diuiſor: then multiplie $\frac{7}{8}, \frac{3}{5}$ and $\frac{2}{3}$ one into the other, and you produce $\frac{7}{20}$ for your diuidend. Finally, diuide $\frac{7}{20}$ by $\frac{5}{8}$, and the quotient giues you $\frac{14}{25}$ of a ſhilling, ſo much ſhall $\frac{3}{5}$ of a li. gaine in $\frac{2}{3}$ of a moneth, after the rate aforeſaid.

x.	m.	c.	x.	li.	s.	d.
				5		6
				3		4
				7		8
				3		5
				2		3

In the ſecond part of the Rule of three Compoſed, you muſt place your numbers as in the firſt, only your third number and your fifth muſt be of one denomination, whereupon you muſt multiplie your third number by your fourth, and the product ſhall be your diuiſor: then multiply your firſt number by your ſecond, and againe by the fifth, and that ſhall be your diuidend, as in theſe examples.

If 8 li. in foure moneths doe gaine $3\frac{1}{5}$ Crownes, in how many moneths will 15 li. gaine 9 Crownes: 8.4.3 $\frac{1}{5}$.15.9. place your numbers in your Table, thus: then multiplie $3\frac{1}{5}$ by 15, or 15 by $3\frac{1}{5}$, and the product will be 48 for your diuiſor. Againe, multiplie 8 by 4, and againe by 9, ſo haue you 288 for your diuidend. Finally, diuide 288 by 48, and the quotient giues you 6 moneths for the anſwere of your queſtion, and alſo for a proofe of the firſt queſtion.

x.	m.	c.	x.	li.	s.	d.
				8		
				4		
			1	6		5
			1	5		
				9		

If $\frac{3}{5}$ of a li. in $\frac{2}{3}$ of a moneth doe gaine $\frac{14}{25}$ of a ſhilling, in

what time shall $\frac{5}{6}$ of a pound gaine $\frac{7}{8}$ of a shilling: place your numbers in your Table, thus: then multiply $\frac{14}{15}$ by $\frac{5}{6}$, and you produce $\frac{7}{18}$ for your diuisor; likewise multiplie $\frac{3}{5}$ by $\frac{2}{3}$, and by $\frac{7}{8}$, so haue you $\frac{7}{20}$ for your diuidend: now because both your numerators are like numbers, therefore cancell them both, and abbreuiate your denominators, so haue you $\frac{3}{4}$ for the answere of your question, and also for the proofe of your second question.

x.	m.	c.	x.	li.	s.	d.
				3		5
				2		3
			I	4	2	5
				5		6
				7		8

In the third part of the Rule of three Composed, you may haue as many numbers (aboue 5) as you please, prouided that the last, and the last saue one be of like denomination; and the question is alwaies from the last to the first, whereof the Rule generall is thus, you must multiplie the number that you desire to know by all the demanding numbers, and that product shall bee your diuidend: then multiplie all the answering numbers, one into the other for your diuisor. Or (to make it more plaine) thus; multiplie the last (which is the number you would know) by the first, and againe by the third, the three demanding numbers, and this shall be your diuidend: then multiplie the second and the fourth (the two answering numbers) together, and their product shall be your diuisor. And thus may you doe, how many soeuer, still leauing one betweene, from the last to the first, or from the first to the last for your diuidend; and likewise from the second to the last saue one for your diuisor, all which you shall plainely perceiue by these following examples.

If 9 Braces of Venice be 5 ells at London, & 45 ells of London be 39 Aulnes at Rouan, I demand how many Braces at Venice, are 13 Aulnes of Rouan 9.5.45.39.13. Place your numbers in your Table, as in the example following: then multiplie 13 (the number that you would know) by 9, and by 45 (the other two demanding numbers) your product will be 5265 for your diuidend. This done, multiplie 39 and 5 (the two answering

swering numbers) one into the other, so haue you 195 for your diuisor. Now if you diuide 5265 by 195 your quotient giues you 27; so many Braces at Venice, are 13 Aulnes of Roum.

x.	m.	c.	x.	li.	s.	d.
				9		
				5		
			4	5		
			3	9		
			1	3		

If $\frac{3}{4}$ of a pound Sterling be $\frac{7}{8}$ of a pound Flemish, and $\frac{1}{12}$ of a pound Flemish bee $\frac{8}{9}$ of a pound Tournoys, I demand what parts of a pound Sterling is $\frac{8}{9}$ of a pound Tournoys? $\frac{3}{4}$ Sterling. $\frac{7}{8}$ Flemish. $\frac{1}{12}$ Flemish. $\frac{8}{9}$ Tournoys. $\frac{8}{9}$ Tournoys. Multiplie $\frac{3}{4}$, $\frac{1}{12}$, and $\frac{8}{9}$, your first, third and fifth numbers one into another, and they make $\frac{1}{18}$ for your diuidend; place that in the second row of your Table; then multiplie $\frac{7}{8}$ and $\frac{3}{5}$, your second and fourth numbers together, and they make $\frac{21}{40}$, place that in the first row of your Table, as you see in the example. Finally, diuide $\frac{1}{18}$ by $\frac{21}{40}$, and your quotient will bee $\frac{20}{189}$; whereby appeareth, that $\frac{8}{9}$ of a pound Tournoys, is $\frac{20}{189}$ of a pound Sterling, which was the question demanded.

x.	m.	c.	x.	li.	s.	d.
			2	1	4	0
				1	1	8
			2	0		
		1	8	9		

If 25 Paulmes of Geanes be $6\frac{1}{2}$ yards at London; and $12\frac{3}{4}$ yards of London bee 17 elles at Antwarpe, and 21 elles of Antwarpe bee $25\frac{1}{2}$ Braces at Luques, I demand how many Palmes at Geanes are 15 Braces of Luques?

1	2	3	4
Geanes.	London. London.	Antwarp. Antwarp.	Luques. Luques.
25.	$6\frac{1}{2}$. $12\frac{3}{4}$.	17. 21.	$25\frac{1}{2}$. 15.
1	2	3	4

To worke this question, or any such like belonging to this third part of the Rule composed, begin at which ende you please, and take the first number, the third, the fifth, and the seuenth, leauing one betweene, as you see noted with these figures 1.2.3.4. those foure numbers multiplie the one into the other, and their product shall be your diuidend: then take the

other three numbers noted with 1.2.3 ouer them, and multiplie them one into the other for your diuisor, as in this example, multiplie 25, 12 3/4, 21 and 15, one into the other, and their off-come will bee 4016251/4. This done, take the other 3 numbers, 6 1/2, 17, 25 1/7, multiply them together, and they produce 13923/7. Finally diuide 4016251/4 by 13923/7, and your quotient will bee 2008125/55692; which brought into vnities, giueth 36 3/132, so many Palmes of Geanes, are 15 Braces of Luques, according to the Rates aforesaid: and thus haue you three examples of the third parte of the Rule of three Composed.

x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
			1	3	9	2	3		5
		4	0	1	6	2	5		4
	2	0	0	8	1	2	5		
			5	5	6	9	2		
						3	6	3/132	

In the fourth part of the rule of three composed, the first number and the last, are euer of one denomination; and the question is alwaies betweene the last, and the last sauing one, the generall rule is thus, you must multiplie the number, that you desire to know by the two answering numbers, that is by the second, and the fourth; or if you please thus, multiplie the fifth number by the fourth, and againe by the second, and that shall be your diuidend; then multiplie the other two demanding numbers, that is the first, and the third together, and their product shall be your diuisor, as in the example.

If 9 Braces of Venice be fiue Elles at London, and 45 elles of London be 39 Aulnes at Roan, I demand how many Aulnes at Roane, are 27 Braces of Venice?

Venice.	London.	London.	Roan.	Venice.
9	5	45	39	27

Place your numbers in your Table, as in the example following: then multiplie 27 your fifth number, by 39 your fourth, and by 5 your second, so haue you 5265 for your diuidend. Againe, multiplie 9 and 45 your first and third numbers together,

ther, and their product is 405 for your diuiſor; ſo diuiding 5265 by 405, your quotient will bee 13, ſo many Aulnes at Roan are 27 Braces of Venice, which is a prooſe of the firſt queſtion in the third part of this Rule of three Compoſed.

x.	m.	c.	x.	li.	s.	d.
				9		
				5		
			4	5		
			3	9		
			2	7		

If $\frac{3}{4}$ of a pound Sterling be $\frac{7}{8}$ of a pound Flemiſh; and $\frac{1}{12}$ of a pound Flemiſh bee $\frac{3}{5}$ of a pound Tournoys, I demand, what parts of a pound Tournoys, is $\frac{20}{189}$ of a pound Sterling?

Sterling. Flemiſh. Flemiſh. Tournois. Sterling.

$\frac{3}{4}$. $\frac{7}{8}$. $\frac{1}{12}$. $\frac{3}{5}$. $\frac{20}{189}$.

3 2 1

multiplie $\frac{20}{189}$, $\frac{3}{5}$, and $\frac{7}{1}$, your fifth, fourth and ſecond numbers together, and they make $7\frac{420}{960}$; which being abbreuiated, is $\frac{7}{16}$ for your diuidend: then multiplie $\frac{3}{4}$ and $\frac{1}{12}$ (your firſt and third numbers) together, and they make $\frac{3}{48}$, which is $\frac{1}{16}$ for your diuiſor: now $\frac{7}{16}$ your diuidend, and $\frac{1}{16}$ your diuiſor, hauing both their numerators alike, there needeth no other worke in the Diuiſion, but onely abbreuiate the denominators, ſo ſhall you haue $\frac{8}{9}$ for the ſolution of your queſtion, and likewiſe for the prooſe of your ſecond queſtiō in the third part of this Rule of 3 cōpoſed.

x.	m.	c.	x.	li.	s.	d.
				x	1	8
				x	1	6
						8
						9

If 25 Palmes of Geanes be $6\frac{1}{2}$ yards at London, and $12\frac{3}{4}$ yards of London be 17 elles at Antwarp, and 21 elles of Antwarpe be $25\frac{1}{7}$ Braces at Luques, I demand how many Braces of Luques, are $36\frac{3}{12}$ Palmes at Geanes?

Geanes. London. London. Antwarp. Antwarp. Luqu. Geanes.

1 2 3

25. $6\frac{1}{2}$. $12\frac{3}{4}$. 17. 21. $25\frac{1}{7}$. $36\frac{3}{12}$.

4 3 2 1

In

In this work (and all such like) you must multiply the last number, the last saue one, the second, and fourth together, & their product shal be your diuidend: the multiplie the first, the third, and the fifth together for your diuisor, as you see noted beneath and aboue with these figures 1.2.3.4, and 1.2.3. therefore first take those foure numbers $36\frac{3}{12}$, $25\frac{1}{7}$, 17, and $6\frac{11}{12}$, and setting them in foure rowes of your Table, multiplie them all one into the other (first, putting them into their broken numbers) so shall you haue $^{1221121250}/_{1220}$, which being abbreuiated, is $^{4016251}/_{4}$ for your diuidend; then take your first, third, and fifth numbers, that is 25, $12\frac{1}{2}$, and 21, and likewise multiplie all them together, so shall you haue $^{26775}/_{4}$ for your diuisor. Now your denominators being like numbers, reie& them both, and diuide the numerator of your diuidend, by the numerator of your diuisor, the quotient giues you 15, so many Braces ar Luques are $36\frac{3}{12}$ Palmes of Geanes, which is a proofe of the third question in the Rule aforegoing. And this may suffise for the Rule of three Composed.

c.	x.	m.	c.	x.	li.	s.	d.
	2	6	7	7	5		4
4	0	1	6	2	5		4
					1	5	

The ende of the second Part.

THE

THE THIRD BOOKE OF THE IEWELL OF ARITHMETICK:

Containing the Rules of Practice, with diuers other necessarie Rules, both for Merchants, Tradesmen, and others.

Rules of Practice.

THere is no Arte of Arithmetick so seuerer∣ther then a kinde of practise, working either by a methode formerly knowne and taught vs, or varied according to the capabilitie of the Artist, for the most speedie and quicke demonstration of the hidden truth, agreeable to the nature and disposition of the proposition, and as in all other Artes, so chiefely in practise, because euery of them, worketh vpon the power and abilitie proper to it selfe, and this vpon any or all of them together.

Sometimes by Addition, as when our value beareth an vnity with an euen part of an vnitie; as if 20 yards were valued at 25 shillings the yard, we see our value beareth one pound, and $\frac{1}{4}$ of 1 li., we therfore adde $\frac{1}{4}$ of our giuen number to our giuen number, that is, $\frac{1}{4}$ of 20 to 20, and it maketh 25 li. our true value.

By subtraction, when our value wanteth an euen part of an vnitie, as if 16 yards were valued at 23 shillings the yard, we [illegible] our given number, and the remainder is 368. our [illegible] value.

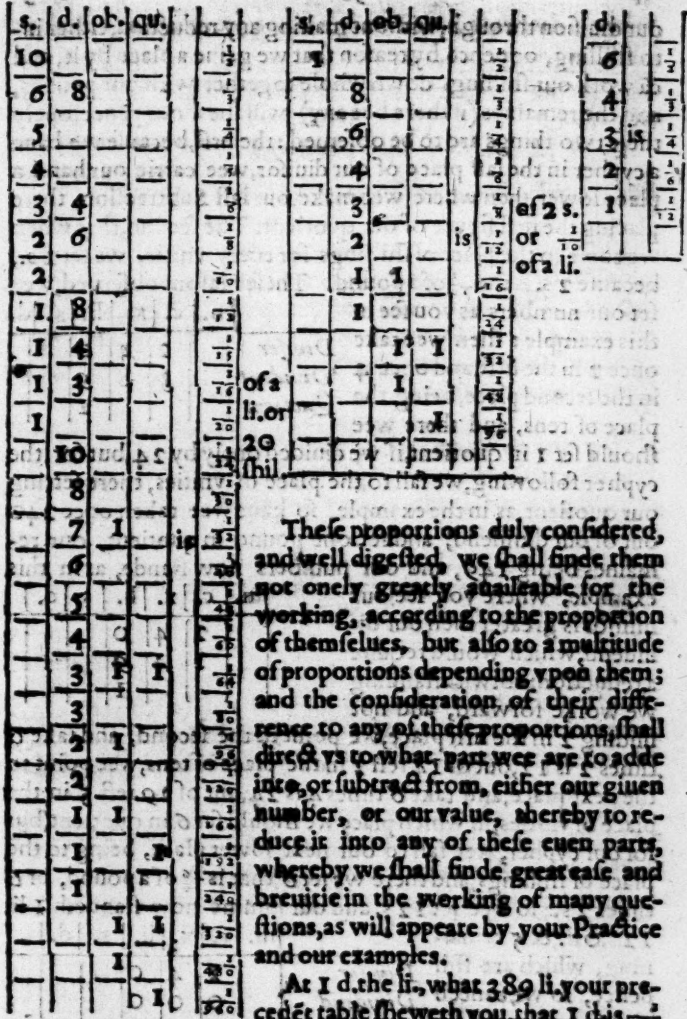
By addition, when our value containeth diuers vnities of any kinde: as if 16 yards were valued at 3 li. a yard, we multiplie our giuen number by 3, and our product giueth 48 pounds for our value.

By Diuision, when our value falleth out to be any euen part, of any vnitie, as 128 yards at 7 d. $\frac{1}{2}$ the yard, we know 7 d. $\frac{1}{2}$ to be $\frac{1}{32}$ of a pound, or 20 shillings, we therefore diuide our giuen number by 32, and finde our quotient 4 li. for our value. The like of any other euen part, either of shillings, pence, or whatsoeuer.

Hereby you perceiue, that as euery of the foure principall Arts of Arithmetick doe worke according to a methode proper to it selfe, so by practice we make choyce of any of them fitting for the purpose of our proposition, and many times of 2, 3, or all of them together: but because by our examples, we muſt manifest both their seuerall and also agreeing operations, we will here forbeare to vrge the discourse, and referre you to those examples, only we aduise you to be perfect in the aliquot parts of a pound or 20 shillings. Likewise of 20 shillings, being the $\frac{1}{20}$ of a pound, and bearing the same proportion to our value, that a pound or 20 shillings doth in a higher nature, vnto one shilling, because, when our giuen number [illegible] a pound, we then work it into shillings, [illegible] rie neerer shire to be knowne, and that you may with more ease know them, wee haue here set you three tables to expresse them,

Sometimes by Addition, as when our value beareth an vnity with an euen part of an vnitie: as if 20 yards were valued at 2 $\frac{1}{2}$ [illegible] the yard, we [illegible] our value beareth one pound, and [illegible] $\frac{1}{2}$, we therefore adde $\frac{1}{2}$ of our giuen number to our giuen number, that is, of 20 to 20, and it maketh 25 for our true va-lue.

There



These proportions duly considered, and well digested, we shall finde them not onely greatly auaileable for the working, according to the proportion of themselues, but also to a multitude of proportions depending vpon them; and the consideration of their difference to any of these proportions, shall direct vs to what part wee are to adde into, or subtract from, either our giuen number, or our value, thereby to reduce it into any of these euen parts, whereby we shall finde great ease and breuitie in the working of many questions, as will appeare by your Practice and our examples.

At 1 d. the li., what 389 li. your precedēt table sheweth you, that 1 d. is $\frac{1}{240}$ of a li., and we hold it much better to diuide by 240: then (cutting off our last figure) to diuide by 24, because we can work

our diuision through, without making any reduction, either into shilling, or pence, by reason that we gaine a place by it, and ca̅ work our shillings down whole together with our pounds, and the remaines (if there bee any) will shew our pence, onely these two things are to be obserued: the first, because we haue a cypher in the last place of our diuisor, wee carrie our hand a place lower, then where wee make our last Subtraction, there placing the first figure of our quotient. The second, that when we come to the place of shillings for euery vnitie, we set 2 s., because 2 s. is the $\frac{1}{10}$ of a pound. These reasons obserued, wee set our numbers as you see in this example: then wee take once 2 in the first, and once 4 in the second place, being the place of tens, and there wee should set 1 in quotient, if we diuided onely by 24, but for the cypher following, we fall to the place of vnities, there setting our quotient, as in the example, so haue wee taken once 240 out of our dividend, and set one pound in quotient, our remaines being 149, and our numbers now stande, as in this example, where you see our diuisor is greater then our dividend, which would require a reduction; notwithstanding we worke forward, and not finding 2 in the first place, we poinct to the second, and take 6 times 2 is 12, out of 14 rest 2 in the place of tens, wee poinct to the next place, and take 6 times 4 is 24, out of 29 rest 5 in the place of vnities, in which place we should set 6 in quotient, but for our cypher, wee fall to our next lower place, being to the place of shillings, and there we set 6, that is $\frac{6}{10}$ of a pound, or 6 times 2 s., so wee set 12 s. and our summe now standeth 1 li. 12 s. 0 d. & 5 remaining, which are still pence, so we cancell our 5, and set 5 d. in the place of pence, and our summes stand as in this example: and thus are you to worke

	m.	c.	x.	li.	s.	d.
Diuisor		2	4	0		
Dividend		3	8	9		
Quotient				1		

	m.	c.	x.	li.	s.	d.
Diuisor		2	4	0		
Dividend		1	4	9		
Quotient				1		

	m.	c.	x.	li.	s.	d.
Diuisor			2	4	0	
Dividend			0	0	0	
Quotient				1	12	5

worke for any of those parts in your Table, that hath a cypher following them.

At 1 d. the yard, what 7545 yardes; set your numbers according to this example, and worke according to the former instructions, and you shall finde 31 li. 8 s. 9 d.

	x.	m.	c.	x.	li.	s.	d.
Diuisor			2	4	0		
Diuidend		7	5	4	5		
Quotient			0	3	1	8	9

At 1 d. $\frac{2}{3}$ the elle, what 5376 ells: 1 d. $\frac{2}{3}$ is the $\frac{1}{160}$ part of a li. therfore set the giuen number in the second row of your Table, and diuide by 160, & your quotient shewes you 33 li. 12 s. 0 d.

Or thus, cancell your first figure 6, for which set 9 d. in the place of pence; then take the halfe of your number a place lower, it giueth 268 $\frac{1}{2}$, or 10 s., take the $\frac{1}{16}$ of this Summe for your value, and finde 33 li. 12 s. 0 d. as before.

At 2 d. the dozen, what shall I pay for 2367 dozen: 2 d. is $\frac{1}{120}$ of a pound; therefore set the giuen number in the second row of your Table, diuide by 120, and you haue 19 li. 14 s. 6 d. for your value. Or you may remoue your numbers a place lower, cancelling your first figure 7, and setting 1 s. 2 d. his value first, and diuide the rest 236 by 12; or you may halfe it lower, making it 118, and thereof take $\frac{1}{6}$, euery way your value will be 19 li. 14 s. 6 d.

At 2 d. $\frac{1}{2}$ the dozen, what is to be paied for 97 grosse (12 dozen is one grosse) therefore set 97 in the second row of your Table, and multiplie it by 12, so haue you 1164 dozen; then 2 d. $\frac{1}{2}$ is $\frac{1}{96}$ of a pound, therefore diuide 1164 by 96, and finde for your value 12 li. 2 s. 6 d.

If the same number were at 2 d. $\frac{1}{4}$ the dozen, wee consider that it wanteth $\frac{1}{10}$ of 2 d. $\frac{1}{2}$, we therfore set our giuen number in the second row of our table, and his $\frac{1}{10}$, that is the same a place lower, in the third row, as you perceiue by this example; and because it wanteth $\frac{1}{10}$, we subtract the same $\frac{1}{10}$ from our giuen number, so haue we remaining 1047 $\frac{6}{10}$ or 12 s., we diuide this by 96, and find our

	x.	m.	c.	x.	li.	s.	d.
				9	6		
		1	1	6	4		
			1	1	6	8	

value 10 li. 18 s. 3 d. Likewise if our value were 2 d. $\frac{1}{2}\frac{1}{4}$, wee know it to be $\frac{1}{10}$ part more then 2 d. $\frac{1}{2}$, we therefore adde the same $\frac{1}{10}$ part into our giuen number, and then haue we 1280 $\frac{8}{10}$ or 8 s, we diuide this by 96, and find for our value 13 li. 6 s. 9 d.: and thus will it be, if you multiply the first by 9, or the second by 11, to make them all farthings, and afterwards bring the into their value, where you see the aduantage that is many times taken by the knowledge of the proportionate parts, that one value beareth to another, and the same value to a pound.

At 3 d. the yard, what 965 yards: 3 d. is $\frac{1}{10}$ of a pound, and $\frac{1}{2}$ of 2 s.; therefore if we diuide our giuen number by 80 in his owne place, or cancell our first figure 5, setting 1 s. 3 d. his value in the places of shillings and pence, and then remoue our giuen number a place lower, making it 96, we may take $\frac{1}{2}$ of this last for our value, both waies wee shall finde 12 li. 1 s. 3 d. for the answere of our question.

But if the same number 965 were valued at 3 d. $\frac{1}{2}$ the piece, then may you multiply your giuen number by 7, to make them all halfe pence, and diuide by 480 to bring them into pounds: or you may take the $\frac{1}{7}$ of your giuen number, and adde into your giuen number, so shal you make their value 3 d. as before, and diuide by 80 as before, both waies you shall finde 14 li. 1 s. 5 d. $\frac{1}{2}$ for the answere of your question.

At 4 d. the pound, what 378 pound: 4 d. is $\frac{1}{60}$ of a li. $\frac{1}{3}$ of 2 s, $\frac{1}{3}$ of 12 d., so that if you diuide it by 60 in the same place, or set it a place lower, and take $\frac{1}{3}$ of it, or first take $\frac{1}{3}$ to make it shillings, and then diuide it by 20, you shall euery way finde 6 li. 6 shillings.

At 5 d. the elle, what 276 elles: 5 d. is $\frac{1}{24}$ of a pound, or 20 s. therefore set the giuen number in the second row of the Table, and diuide it by 48, and finde 5 li. 15 s. 0 d. Or thus 5 d. is $\frac{1}{4}$ more then 4 d., therefore ad $\frac{1}{4}$ of your giuen number, to your giuen number, and you produce 345 groats, which wrought as before for 4 d., giueth 5 li. 15 s. 0 d. Againe, 5 d. wanteth $\frac{1}{2}$ of 6 d., therefore Subtract $\frac{1}{2}$ of your giuen number from your giuen number, the remaines 230 are sixpences, and their totall maketh 5 li. 15 s. 0 d. as before.

At 6 d. the yard, what 397 yards: 6 d. is $\frac{1}{40}$ of a li. $\frac{1}{20}$ of 2 s, $\frac{1}{3}$

of

of 12 d.; and if you diuide it by 40 in his owne place, by 4 a place lower, or take $\frac{1}{2}$ of it, and then worke as for a ſhilling, you ſhall euery way finde 9 li. 18 s. 6 d.

At 7 d. the yard, what 156 yards: multiplie the giuen number by 7, and the product 1092 are pence; diuide by 240, the quotient giueth you 4 li. 11 s. 0 d. Or thus, take $\frac{1}{2}$ of your giuen number, which is 26: now becauſe 7 d. is $\frac{1}{2}$ of 6 d. more then 6 d, adde this $\frac{1}{2}$ to your giuen number, ſo haue you 182 ſixpences, worke as before for 6 d, and finde 4 li. 11 s. 0 d.

At 8 d. the dozen, what 279 dozen: 8 d. is $\frac{1}{10}$ of a pound, $\frac{1}{3}$ of 2 s.; if you diuide by 30 in the ſame place, or by 3 lower, you ſhall finde 9 li. 6 s. 0 d.

At 9 d. the elle, what 367 elles, multiplie 367 by 9, ſo haue you 3303 pence, worke as is formerly taught for pence, and you ſhall finde 13 li. 15 s. 3 d.

Or thus, 9 d. is 6 d., and halfe 6 d., ſo if you take $\frac{1}{2}$ of 367, you ſhall finde 183 $\frac{1}{2}$; adde this to 367, and then haue you 550 $\frac{1}{2}$, ſixpences. Likewiſe 9 d. wanteth $\frac{1}{4}$ part of 12 d., and if you ſubtract $\frac{1}{4}$ part of 367 (being 91 $\frac{1}{4}$) from 367, the remaines will be 275 $\frac{1}{4}$ ſhillings, and both wales your whole value will be 13 li. 15 s. 3 d.

At 10 d. the pound, what 147 pounds: 10 d. is $\frac{1}{24}$ of a pound or 20 s., therefore diuide the giuen number by 24, and the quotient giues you 6 li. 2 s. 6 d. for your value. Againe, 10 d. is 8 d. and $\frac{1}{4}$ of 8 d., therefore take $\frac{1}{4}$ of 147, and you ſhall haue 36 $\frac{1}{2}$, adde this into 147, and then haue you 183 $\frac{1}{2}$, eight-pences; worke as for 8 d., and finde 6 li. 2 s. 6 d. as before. Alſo 10 d. wanteth $\frac{1}{5}$ of 12 d., and if you ſubtract $\frac{1}{5}$ of 147 from 147, there remaines ſhewes you 122 $\frac{1}{2}$ ſhillings.

At 11 d. the yard, what 298 yards: multiplie 298 by 11, your product will bee 3278 pence; worke as for pence, and you ſhall finde

	£.	c.	£.	li.	s.	d.
The diuiſor.			2	4		
The giuen number.		2	9	8		
His tenth.			2	9	16	
Both together.		3	2	7	16	
The value.			1	3	13	-2

13 li.

13 li. 13 s. 2 d. Or thus, 1 l. is 10 d. and ½ of 10 d.; therefore set your giuen number in the second row of your Table, and the same a place lower in the 3 d row, and they stand as in the example aforegoing: then adde the one into the other, and they make 327 ½ tenne pences. Now you know that ½ of 10 d. is 8 d., therefore first cancell your ½, for which set 8 d., then worke the rest as is formerly taught for 10 d., and finde 13 li. 13 s. 2 d. as before.

Hauing now discourſed vpon all the pence beneath a ſhilling, we will likewiſe inſtruct you in the working for ſhillings, wherein we will ſo contriue it, that euery two queſtions ſhall be a prooſe each of other; which we may eaſily doe, by working vpward and downeward, from the leaſt to the greateſt, and from the greateſt toward the leaſt, till we meete in the middle; whereby at euery approch, the addition of the two values ſhall make the giuen number, and bee a prooſe of both queſtions.

Example.

At 12 d. the yard, what 476 yards? ſet the giuen number in the ſecond row of your Table, then point to each figures lower place, and take his halfe, ſo haue you 23 li. 16 s. 0 d. for your value.

At 19 s. the yard, what 476 yards, we might now ſubmit our former value, and briefely ende our worke; but becauſe it may be a prooſe of both, we will worke it by our former reaſon, pointing to each figures lower place, and multiplying by 9 ½, which multiplication produceth for our value, 452 li. 4 s. 0 d. Now if we adde theſe two values together, that is to ſay 452 li. 4 s. 0 d., and 23 li. 16 s. 0 d., they produce 476 our firſt giuen number, approuing the truth of both workings.

At 2 s. the elle, what 695 elles: 2 s. is $\frac{1}{10}$ of a pound or 20 s., and requires no worke, but onely ſet it a place lower, and finde 69 li. 10 s. 0 d.

At 18 s. the elle, what 695 elles: ſubtract the former value, or point to each figures lower place, and multiplie by 9, ſo ſhal you finde 625 li. 10 s. 0 d., which may be prooued by the former reaſon.

At 3 s. the piece, what 478 pieces: either remoue it lower, or

point

Point to each figures lower place, and multiplie by 1½, that is, set the ſame, and halfe the ſame, as once 4 is 4, and halfe 4 is 2, once 7 is 7, and halfe 7 is 3½, once 8 is 8, and halfe 8 is 4, which worke giueth for your value, 71 li. 14 s. 0 d.

At 17 s. the piece, what 478 pieces? Set 478 in the ſecond row of your Table, point to each figures lower place, and multiplie by 8½, as thus; 8 times 4 is 32, and halfe 4 is 2; 8 times 7, is 56, and halfe 7 is 3½; 8 times 8 is 64, and halfe 8 is 4; this operation produceth for your value 406 li. 6 s. 0 d.

At 4 s. the doller, what 352 dollers? 4 s. is ⅕ of 20 s., and whenſoeuer we diuide by 5, we onely point a place lower, and multiplie by 2, which worke giueth for our value 70 li. 8 s. 0 d.

At 16 s. the hundred, what 452 hundreds? Point lower, and multiplie by 8, ſo ſhall you haue for your value 361 li. 12 s. 0 d.

At 3 s. the elle, what 792 elles? You may worke this by pointing lower, and multiplie by 1½, one being ½ of 2, but holde it better to take the ½ in his owne place, both which you ſhall finde 198 li. 5 s. 0 d.

At 5 s. the elle, what 792 elles? You may multiplie by 3, and take ½ of the product; or you may point lower, and multiplie by 7½, howſoeuer, your value will be 594 li. 15 s. 0 d.

At 6 s. the groſſe, what 534 groſſe? Multiplie lower by 3, and finde for your value 160 li. 4 s. 0 d.

At 14 s. the groſſe, what 534 groſſe? Multiplie by 7 a place lower, and finde 373 li. 16 s. 0 d.

At 7 s. the ducket, what 468 duckets? Multiplie by 3½ lower, and your value 163 li. 12 s. 0 d.

At 13 s. the elle, what 96 elles? Multiplie lower by 6½, ſo haue you 62 li. 8 s. 0 d.

At 8 s. the yard, what 79 yards? Multiplie lower by 4, and you ſhall haue 31 li. 12 s. 0 d.

At 11 s. the yard, what 429 yards? Multiplie lower by 5½, and your value will be 471 li. 8 s. 0 d.

At 9 s. the pound, what 257 lb. Multiplie lower by 4½, it produceth 115 li. 13 s. 0 d.

At 15 s. the pound, what 457 li. Here you may adde ½,

and take the $\frac{2}{3}$, or you may first take $\frac{1}{3}$, and then adde $\frac{1}{10}$: likewise you may take his $\frac{1}{3}$ in his owne place, and in his lower place, and adde them together; or you may multiplie by $5\frac{1}{2}$ lower, euery way, your value will be 141 li. 7. s. 0 d.

At 10 s. a table, what 356 tables? we doubt not but you can long since take the $\frac{1}{2}$ of any number by your table, and taking the $\frac{1}{2}$ of this, you will find 178 li. 0 s. 0 d. for your value: of which there needeth no proofe, but double it againe, and make your first number.

Thus according to our promise haue wee made them to meete in the middle; if yet you desire a reason of these workings, you know that 2 s. is $\frac{1}{10}$ of a pound, or 20 s. and requires none other worke, but onely the setting a place lower. Now if 2 s. require the same in a lower place, then 2 s. being 2 s. and halfe 2 s. must needes require the same, and halfe the same in a lower place. So 4 s. being twice 2 s. requires 2 times the same in a lower place. Likewise 7 s. being 3 times 2 s. and halfe 2 s. requires 3 times the same, and halfe the same: and so forth of all the rest, and this is the reason whereupon these rules are grounded.

What sister can worke for shilling and pence seuerally, it is probable inough, then can she likewise worke the rule to goe therto considering how her master doth sell one measure, and accordingly to the proportion of his value, and take them together for the resolution of her question: but for this time in many respects vnfit to belong to the Table, we will giue you some examples for a ground of the rest: and first

If 87 yards of cloth cost 7 li. 5 s. what will 13 yards amount vnto? Multiplie 87 by 13, you will finde 1131 pence, or if you take $\frac{1}{12}$ of 87, you shall haue 7 $\frac{1}{2}$ which addeth to 87, maketh 94 shillings. Or if you diuide 87 by 20, you shall haue 4 li. 7 s. 0 d. and $\frac{1}{2}$ of this quotient being 2 s. 6 d. must also be set to the rest: any of these waies, your value will be 4 li. 14 s. 3 d. ob.

At 12 s. the yard, what 3 yards 3 quarters 3 nailes? 12 s. is a pound, and $\frac{1}{20}$ of a shilling; therefore take $\frac{1}{20}$ of 39 (which is $1\frac{19}{20}$) and adde to 39, so is it you 80 $\frac{1}{2}$ shillings, whose value you know to be 4 li. 0 s. 6 d.

At 15 d. the pound, what 273 pound? take $\frac{1}{20}$ of 273 s. (being

68 ½) adde this to 275, and they make 343 ½ shillings: ordinside 275 by 16, becauſe 15 d. is ¼ of 20 s., and finde your value 17 li. 3 s. 9 d.

At 16 d. the dozen, what 138 dozen, diuide by 15, and find 9 li. 4 s. 0 d.: or take ¼ of 138 (which is 46); now if you adde this 46 and 138 together, they make 184 ſhillings: likewiſe, if you ſubtract 46 from 138, the remaines will bee 92, euery one being 2 s, ſo that if you worke 184 as for ſhillings, or 92 a place lower, both waies you haue 9 li. 4 s. 0 d. for your value. The reaſon, 16 d. is ⅓ more then 1 s., and ⅓ leſſe then 2 s.

And now, wee hope, you are ſufficiently informed of theſe kindes of worke, wherefore now let vs make choice of three or foure queſtions at randome, wherewith to conclude this kind of Practice.

At 2 s. 5 d. the elle, what 679 elles: ſet the giuen number in the ſecond, &

	x.	m.	c.	x.	li.	s.	d.
Diuiſor.				4	8		
Giuen number.			6	7	9		
The ſame lower.				6	7	18	
The queſtient.				1	4	2	11
Added together				8	2	0	11

the ſame a place lower in the third row of your Table, then will they ſtand thus. This done, diuide the number in the ſecond row by 48, and ſtil as your queſtient riſeth, ſtil it into your number in the third row, ſo ſhall you find 82 li. 0 s. 11 d. for your value. The reaſon of this worke is, that in ſetting it lower, you haue wrought for 2 s. of your value, then 5 d. is ½ of 20 s, ſo diuiding by 48, and adding into the former, muſt needes giue the whole value: for proofe, multiplie 82 li. 0 s. 11 d. into pence, and diuide by 679, and find 29 d. your firſt value, or diuide by 29, and finde 679 your giuen number; or multiplie 679 by 29 into pence likewiſe, and they both make one and the ſame number; any of all theſe are ſufficient proofes, either for this queſtiō, or any other in the ſame nature.

At 8 s. 7 d. the yard, what 247 yards: ſet the giuen number in the ſecond row of your Table, in the third row take ⅛ of it, ſo haue you wrought for 3 s. 4 d. of your value, the remaines 5 d.

is $\frac{2}{3}$ of a pound, or 20 s.; therefore diuide the giuen number by 30, and as the quotient riseth, adde it into the former $\frac{2}{3}$ part, and they together produce 44 li. 5 s. 1 d. for your value.

At 14 s. 8 d. the dozen, what 376 dozen? Set the giuen number in the second row; then point lower, and multiply by 7, so haue you wrought for 14 s.; then 8 d. is $\frac{2}{5}$ of 20 s., therefore worke with 30, as you did before, and find for your value 275 li. 14 s. 8 d.

At 19 s. 9 d. the hundred, what 479 hundreds? Diuide the giuen number by 80, or worke as for 3 d., and your quotient will bee 379 li. 19 s. 9 d.; subtract this from the giuen number, and your remainder giues you 473 pound, 0 s. 3 pence, for your true value.

These examples may instruct you for the working of any value of shillings and pence together, if you can wisely make choyce of the nearest proportion to your value. But if it fall out so vncouth, that you can hardly draw it to any euenness, you may then worke for his opposit value, and subtract that from your giuen number, as in the last example; if yet neither the one, nor the other can be conueniently wrought vpon, you may reduce it into his least denomination, and by that meanes worke your desire; and thus we conclude this kinde of Practice.

There are yet Rules of Practice in a plurall kind, of whose working there may the like aduantage be taken, by the onely knowledge of those proportionate parts before handled, of which we will giue you three or foure examples for a generall obseruation.

If 7 cost 5 s., what 64? 5 s. is $\frac{1}{4}$ of 20 s., therefore multiplie 7 by 4, and thereof commeth 28, diuide 64 by 28, and you haue 2 li. 5 s. 8 d. $\frac{4}{7}$, so much is to bee paide for 64, if 7 cost 5 shillings.

If 9 cost 20 d., what 356? Set 9 in the first, and 356 in the second row of your Table; then consider that 20 d. is $\frac{1}{12}$ of 20 s., therefore multiplie 9 by 12, and the product is 108, diuide 356 by 108, and the quotient giues you 3 li. 5 s. 11 d. $\frac{8}{9}$; so much must be paid for 356, if 9 cost 20 d.

If 6 cost 11 d., what 576? Here are you to obserue as before, that

that 10 d. is $\frac{1}{14}$ of 20 s., and 1 d. $\frac{1}{10}$ of 10 d., therefore you muſt ſet 576 in the ſecond row, and his $\frac{1}{10}$, 57 $\frac{6}{10}$ in the third row of your Table; then adde them together, and they make 633 $\frac{6}{10}$, or 12 s., and now are they all ten-pences; therefore multiplie 24 (the proportion that 10 d. beareth to 20 s.) by 6, and your product 144 is your diuiſor, ſo diuiding 633 $\frac{6}{10}$ by 144, the quotient ſhewes you 4 li. 8 s. 0 d.; ſo much muſt you pay for 576, if 6 coſt 11 d.

If 4 coſt 3 d. $\frac{1}{2}$, what 879? Set your giuen number in the ſecond row of your Table, in the third row take his $\frac{1}{2}$, it giueth 146 $\frac{1}{2}$, adde this into the giuen number, they make together 1025 $\frac{1}{2}$ three-pences. Now 3 d. is $\frac{1}{4}$ of a ſhilling, $\frac{1}{4}$ of 2 s., and $\frac{1}{20}$ of 20 s.; therefore if you multiplie 4 by 4, you ſhall haue 16 for your diuiſor, and your quotient will be ſhillings; if you multiplie 8 by 4, you ſhall haue 32 your diuiſor, and your quotient 2 s.; if you multiplie 80 by 4, you ſhall haue 320, and your quotient will be pounds; euery way your value will be 3 li. 4 s. 1 d. $\frac{1}{2}$, the true worth of 879, if 4 coſt 3 d. $\frac{1}{2}$; and theſe foure examples are ſufficient for the inſtruction of this kinde of practice; wherein you may obſerue for a generall Rule, that whatſoeuer your value be, if you can reduce it into any euen part of a pound, or 20 s., and then multiplie that part (whither $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{12}$, $\frac{1}{16}$, or any other) by ſo many, as you are to haue for your value, that product ſhall be your diuiſor, wherby to diuide your giuen number, as you perceiued by our laſt example.

For a concluſion, there is yet a kind of practice in fractions, or broken numbers, of which we will giue you a few examples, and ſo conclude, leaſt our volume grow greater, then we willingly would haue it.

If one coſt $\frac{3}{7}$ of a penny, what ſhall I pay for 8765? Set your giuen number in the ſecond row of your table, and diuide it by the denominator of your value, that is by 5, the quotient giues you 1753 three-pences; worke as for 3 d., and find 21 li. 18 s. 3 d. ſo much is to be paid for 8765, if one coſt $\frac{3}{7}$ of a penny.

If one coſt $\frac{7}{9}$ of a penny, what 467? If you diuide your giuen number by 9, (your Denominator) you ſhall (as before) bring it into 7 d. the proportion of your Numerator, but then you ſhall haue 51 $\frac{8}{9}$ of 7 d., which fraction will require a new

worke in the conclusion, and it may be the second worke, may leaue a smaller fraction, whereby we shall be forced to make a double worke in reducing our fractions, all which to auoide, set your giuen number 467 in the second row of your table, and worke is strikes 7 d., your value will bee 13 li. 12 s. 5 d. diuide this by 9, and the quotient giues you 1 li. 10 s. 3 d. $\frac{2}{9}$, so much must be paid for 467, if one cost $\frac{7}{9}$ of a penny.

If 7 cost $\frac{11}{19}$ of a shilling, what must be paid for 389: set the giuen number in the second row of the table, and worke it into the value of the numerator, that is 11 s., so shall you haue 213 li. 19 s. 0 d. Now if you diuide this value by 13, it answeres the question, as if one cost $\frac{11}{19}$ of a shilling; but wee demanded if 7 cost $\frac{11}{19}$, therefore multiplie 13 by 7, and thereof commeth 91 for your diuisor; so diuiding 213 li. 19 s. 0 d. by 91, your quotient giues you 2 li. 7 s. $\frac{2}{91}$, so much must be paid for 389, if 7 cost $\frac{11}{19}$ of a shilling.

If 8 cost $\frac{5}{7}$ of a pound, or 20 s, what cost 465: worke as for 6 li, that is, multiplie the giuen number, in the second row of the table by 6, your product will bee 2790; then multiplie 7 by 8, so haue you 56 for your diuisor; diuide 2790 by 56, your quotient shewes you 49 li. $\frac{43}{56}$ or $\frac{21}{28}$, whose value is 16 s. 5 d. $\frac{3}{7}$ whereby appeareth, that if 8 cost $\frac{5}{7}$ of 20 s., then 465 will cost 49 li. 16 s. 5 d. $\frac{3}{7}$.

If $\frac{3}{4}$ of a yard cost $\frac{2}{11}$ of a penny, what must I pay for 976 yards: set the giuen number in the second row of your Table, and multiplie it by 5, your product will bee 4880, and now is your question changed into the nature of those aforegoing, that is, as if 4 should cost $\frac{2}{11}$ of a penny, therefore worke this product according to the value of 9 d. the yard, so shall you haue 183 li. 0 s. 10 d.; then multiplie 11 by 4, it maketh 44; diuide 183 li. 0 s. 0 d. by 44, and the quotient will be 4 li. 3 s. 2 d. $\frac{12}{44}$; so much must bee paid for 976 yards, if $\frac{3}{4}$ of one yard cost $\frac{2}{11}$ of a penny.

If $\frac{2}{3}$ of a yard cost $\frac{11}{19}$ of a shilling, what cost 2675 yards: multiplie the giuen number in the second row of the Table by 9, your product will be 24075; worke these as if they were 13 s. a piece, and their value will be 15648 li. 15 s. 0 d.; this done, multiplie 17 by 9, so haue you 119 for your diuisor; then diuide

uide 15648 li. 15 s. 0 d. by 119, and your quotient ſhewes you 131 li. 10 s. $\frac{1}{119}$, the iuſt worth of 2675 yards, if $\frac{7}{8}$ of one yard coſt $\frac{11}{17}$ of a ſhilling.

Theſe examples are ſufficient for your inſtruction in this kinde of practice, and the reaſon of it is ſhewne in the worke for the proofe of it, multiplie your value into his leaſt denomination, as in your firſt queſtion into $\frac{1}{7}$ of a penny; and if you haue any broken parts, adde them into the product; then diuide by the numerator, and it ſhall returne you your giuen number. But if it be a double fraction, as in this laſt queſtion after your multiplication into his leaſt denomination, and the adding in of your fraction, you muſt conſider that in your worke, the numerator of your firſt fraction, multiplied the denominator of your ſecond fraction, for your diuiſor; ſo for your proofe, the denominator of your firſt fraction, muſt multiplie the numerator of your ſecond fraction, and by that product diuide your whole reduction, it returnes your giuen number, and thus we conclude our Rules of Practice.

Reduction of Meaſures.

ONe elle at Antwarp is $\frac{3}{4}$ of a yard at London. In 376 elles at Antwarp, how many yards at London: ſet the giuen number in the ſecond row of the Table, and multiplie it by 3, the numerator of the fraction, your product will be 1128, diuide this by 4, or take the $\frac{1}{4}$ of it, and the queſtion giueth 282 yards at London: Or thus, take $\frac{1}{4}$ of 376 (being 94) and ſubtract from 376, the remaines is 282, as before.

Norremburg.

One elle at Norremburg is $\frac{150}{209}$ of a yard at London: In 695 elles at Norremburg, how many yards at London? multiplie 695 by 150, the product will be 104250, diuide this by 209 your quotient glues you 498 $\frac{148}{209}$ yards at London.

Franckfort.

One elle at Franckfort is $\frac{3}{5}$ of a yard at London: In 275 elles at Franckfort, how many yards at London: multiplie by 3, and diuide by 5; or which is better, point to each figures lower place,

place, and multiplie by 6, both waies you shall find 185 yards at London,

Dantzick.

One elle at Dantzick is $\frac{71}{111}$ of a yard at London; In 457 elles at Dantzick, how many yards at London? Multiplie by 75, and diuide by 83, so haue you $412\frac{70}{111}$ yards at London.

By these foure examples, you perceiue the order of working your Reduction, when you know the difference of one measure from another. Now for your certaine knowledge of this difference, wee haue here set you downe a Table, wherein not onely the difference of other Countries with our English measures, but also their proportions one with another are plainely demonstrated.

Places haue the Table of Measures.

Yard at London is	50/13	46/25	49/30	8/5	36/25	62/75	27/25	4/5	52/75	19/25	61/75	29/25	83/75	5/3	209/150	4/3	1/1	
Elle at Antwarp is	75/26	69/50	49/40	6/5	27/25	31/50	81/100	3/5	13/25	57/100	61/100	87/100	83/100	5/4	209/200	1/1	3/4	
Elle at Norremberge is	7500/2717	276/209	245/209	240/209	216/209	124/209	162/209	120/209	104/209	114/209	122/209	174/209	166/209	250/209	1/1	200/209	150/209	
Ell at Franck. Leibs. Presl. is	30/83	238/125	49/50	24/25	108/125	62/125	81/125	12/25	52/125	57/125	61/125	87/125	83/125	1/1	209/250	4/5	3/5	
Elle at Dantzick is	3750/1079	138/83	245/166	120/83	108/83	62/83	81/83	60/83	52/83	57/83	61/83	87/83	1/1	125/83	209/166	100/83	75/83	
Elle at Vienna Austria is	1250/377	46/29	245/174	40/29	36/25	62/87	27/29	20/29	52/87	57/87	61/87	1/1	83/87	125/87	209/174	100/87	25/29	
Aulne at Lyons France is	3750/793	138/67	245/122	120/61	108/61	62/61	81/61	60/61	52/61	57/61	1/1	87/61	83/61	125/61	209/122	100/61	75/61	
Aulne at Parris is	1250/247	46/19	245/114	40/19	36/19	62/57	27/19	20/19	52/57	1/1	61/57	87/57	83/57	125/57	209/114	100/57	25/19	
One Aulne at Rouan is	1250/338	40/26	245/104	30/13	27/13	31/26	81/52	15/13	1/1	57/52	61/52	87/52	83/52	125/52	209/104	25/13	75/52	
Vare at Lisbon is	125/26	23/10	49/24	2/1	9/5	31/32	27/20	1/1	13/15	19/20	61/60	29/20	83/60	25/12	209/120	5/3	5/4	
Vare at Sivell is	1250/351	46/27	245/162	40/27	4/3	62/81	1/1	20/27	52/81	19/27	61/81	29/27	83/81	125/81	209/162	100/81	25/27	
Vare at the Isles Madere is	1875/403	69/38	245/124	40/31	54/31	1/1	81/62	30/31	26/31	57/62	61/62	87/62	83/62	125/62	209/124	50/31	75/62	
Brace at Venice is	625/234	23/18	245/216	10/9	1/1	31/54	3/4	5/9	13/27	19/36	61/108	29/36	83/108	125/108	209/216	25/27	25/36	
Brace at Luques is	125/52	23/20	49/48	1/1	9/10	31/60	27/40	1/2	13/30	19/40	61/120	29/40	83/120	25/24	209/240	5/6	5/8	
Brace at Florence is	1500/637	276/245	1/1	48/49	216/245	124/245	162/245	24/49	104/245	114/245	122/245	174/245	166/245	50/49	209/245	40/49	30/49	
Brace at Millan is	625/299	1/1	245/276	20/23	18/23	31/69	27/46	10/23	26/69	19/46	61/138	29/46	83/138	125/138	209/276	50/69	25/46	
Palme at Geanes is	1/1	299/625	637/1500	52/125	234/625	403/1875	351/1250	26/125	338/1875	247/1250	793/3750	377/1250	1079/3750	13/30	2717/7500	26/75	13/30	

The vse of this Table is thus; you must consider of which of these places your measure is, and into which of these places you would reduce it: then seeke in the side Margent of the Table for the place of whence it is, and goe along that parallel, till in the vpper Margent you meete with the place, into which you would reduce it, in that square you haue the proportion that one beareth to the other; then whatsoeuer number you haue, multiply that number by the numerator, and diuide the product by the denominator, the quotient shewes you how many of those measures are in so many of the other. For example, suppose that we had 148 Braces of Venice, and we would know how many Aulnes they make at Rouan: we finde Venice in the side Margent, and we goe along that parallel till we meete with Rouan; in that square we finde $\frac{13}{27}$, shewing that 1 Brace of Venice is $\frac{13}{27}$ of an Aulne at Rouan; we therfore multiplie 148 (our Braces) by 13 (the numerator of our fraction), and our product is 1924, this wee diuide by 27 (our denominator) and the quotient giues vs $71\ \frac{7}{27}$ Aulnes of Rouan. Againe, imagine that we had 126 Aulnes of Rouan, and would know how many Elles they make at London: wee finde Rouan in our side Margent, and in that parallel wee meete with Lisbon (the Vare at Lisbon, and the Elle at London being all one) and there wee finde $\frac{15}{13}$; we therefore multiplie 126 by 15 (the numerator) it produceth 1890, this we diuide by 13 (the denominator) and finde $145\ \frac{5}{13}$ Elles at London; and thus of any other.

Place this Table betwixt Follio 96 and 97.

place, and multiplie by 6, both waies you shall find 165 yards at London,

Dantzick.

One elle at Dantzick is $\frac{71}{77}$ of a yard at London; In 457 elles at Dantzick, how many yards at London? Multiplie by 75, and diuide by 83, so haue you 412 $\frac{70}{77}$ yards at London.

By these foure examples, you perceiue the order of working your Reduction, when you know the difference of one measure from another. Now for your certaine knowledge of this difference, wee haue here set you downe a Table, wherein not onely the difference of other Countries with our English measures, but also their proportions one with another are plainely demonstrated.

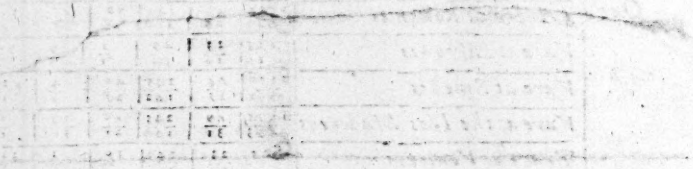
Place here the Table of Measures.

This Table is reduced into the agreement of these places, one with another, according to an vnitie, and proportioned to our English yard, in respect that the Vare of Lisbon is all one with our Elle; so that when wee will worke into Elles English, wee make choice of Lisbon to compare with any of these places.

The side Margent. / The vpper Margent.	Geanes	Millan	Florence	Luques	Venice	The Isles	Smell Spaine	Lisbon	Rouan Norm.	Parris	Lyons	Vienna	Dantzick	Frankeford, &c.	Norremberge	Antwarp	London
Yard at London is	10/13	46/25	49/30	8/5	36/25	62/75	27/25	4/5	52/75	19/25	61/75	29/25	83/75	5/3	209/150	4/3	1/1
Elle at Antwarp is	75/26	69/50	49/40	6/5	27/25	31/50	81/100	3/5	13/25	57/100	61/100	87/100	83/100	5/4	209/200	1/1	3/4
Elle at Norremberge is	7500/3717	276/209	245/209	240/209	216/209	124/209	162/209	120/209	104/209	114/209	122/209	174/209	166/209	250/209	1/1	200/209	150/209
Ell at Franck. Leibs. Prest. is	30/13	138/125	49/50	24/25	108/125	62/125	81/125	12/25	52/125	57/125	61/125	87/125	83/125	1/1	209/250	4/5	3/5
Elle at Dantzick is	3750/1579	138/83	245/166	120/83	108/83	62/83	81/83	60/83	52/83	57/83	61/83	87/83	1/1	125/83	209/166	100/83	75/83
Elle at Vienna Austria is	1250/377	46/29	245/174	40/29	36/25	62/87	27/29	20/29	52/87	57/87	61/87	1/1	83/87	125/87	209/174	100/87	25/29
Aulne at Lyons France is	3750/793	138/61	245/122	120/61	108/61	62/61	81/61	60/61	52/61	57/61	1/1	87/61	83/61	125/61	209/122	100/61	75/61
Aulne at Parris is	1250/247	46/19	245/114	40/19	36/19	62/57	27/19	20/19	52/57	1/1	61/57	87/57	83/57	125/57	209/114	100/57	25/19
One < Aulne at Rouan is	1250/338	69/26	245/104	30/13	27/13	31/26	81/52	15/13	1/1	57/52	61/52	87/52	83/52	125/52	209/104	25/13	75/52
Vare at Lisbon is	125/26	23/10	49/24	2/1	9/5	31/30	27/20	1/1	13/15	19/20	61/60	29/20	83/60	25/12	209/120	5/3	5/4
Vare at Siuell is	1250/311	46/27	245/162	40/27	4/3	62/81	1/1	20/27	52/81	19/27	61/81	29/27	83/81	125/81	209/162	100/81	25/27
Vare at the Isles Madere is	1875/403	69/31	245/124	60/31	54/31	1/1	81/62	30/31	26/31	57/62	61/62	87/62	83/62	125/62	209/124	50/31	75/62
Brace at Venice is	625/234	23/18	245/216	10/9	1/1	31/54	3/4	5/9	13/27	19/36	61/108	29/36	83/108	125/108	209/216	25/27	25/36
Brace at Luques is	125/52	23/20	49/48	1/1	9/10	31/60	27/40	1/2	13/30	19/40	61/120	29/40	83/120	25/24	209/240	5/6	5/8
Brace at Florence is	1500/637	276/245	1/1	48/49	216/245	124/245	162/245	24/49	104/245	114/245	122/245	174/245	166/245	50/49	209/245	40/49	30/49
Brace at Millan is	625/299	1/1	245/276	20/23	18/23	31/69	27/46	10/23	26/69	19/46	61/138	29/46	83/138	125/138	209/276	50/69	25/46
Palme at Geanes is	1/1	299/625	637/1500	52/125	234/625	403/1875	351/1250	26/125	338/1875	247/1250	793/3750	377/1250	1079/3750	13/30	2717/7500	26/75	13/50

The vse of this Table is thus; you must consider of which of these places your measure is, and into which of these places you would reduce it: then seeke in the side Margent of the Table for the place of whence it is, and goe along that parallel, till in the vpper Margent you meete with the place, into which you would reduce it, in that square you haue the proportion that one beareth to the other; then whatsoeuer number you haue, multiply that number by the numerator, and diuide the product by the denominator, the quotient shewes you how many of those measures are in so many of the other. For example, suppose that we had 148 Braces of Ve-

place, and multiplie by 6. both waies you ſhall find 1152 yards



Briefe Rules for the hundred weight, allowing 112 *li. to the hundred.*

HE that multiplieth the pence (that one pound waight is worth) by 7, and divideth the product by 15, ſhall finde the pounds that the 112 li. waight is worth: and likewiſe, hee that multiplieth the pounds in money, that 112 li. waight is worth by 15, and divideth the product by 7, ſhall finde the pence that one pound waight is worth.

Example.

At 7 d. the pound waight, what ſhall the 112 li. waight bee worth? multiplie 7 d. by 7, and the product is 49; divide 49 by 15, and the quotient giueth 3 $\frac{4}{15}$ li., that is, 3 li. 5 ſ. 4 d.; ſo much is the 112 li. waight worth.

At 9 li. the 112 li waight, what ſhall one pound waight bee worth? multiplie 9 by 15, the product will be 135; divide this by 7, and the quotient giueth you 19 $\frac{2}{7}$ d. ſo many pence is 1 li. waight worth.

He that multiplieth the ſhillings that 112 pound waight is worth by 3, and divideth the product by 28, ſhall finde the pence that 1 li. waight is worth. And likewiſe hee that multiplieth the pence that 1 li. waight is worth by 28, and divideth the product by 3, ſhall find the ſhillings that the 112 li. waight is worth.

Example.

At 40 ſhillings the 112 li. waight, what one li. waight? multiplie 40 by 3, and the product is 120; divide 120 by 28, and the quotient giueth 5 $\frac{1}{7}$ d. ſo much ſhall the pound waight bee worth.

At 5 d. the li. waight, what ſhall the 112 li. waight be worth? multiplie 5 d. by 28, and the product is 140; divide 140 by 3, and the quotient giueth 46 $\frac{2}{3}$ ſhillings, ſo much muſt the 112 li. waight coſt.

The Rule of Fellowship without time.

IN the Rule of Fellowship without time, you must onely obserue to set downe each mans stocke one vnder the other, and then adde them all into one totall, which totall shall bee your generall diuisor; then the gaine or losse (which soeuer happeneth) shall be your multiplicand, and each seuerall stock your multipliers; so that multiplying the gaine or losse by each seuerall stocke, and diuiding the product by the totall of all their stockes, shall giue each parmers proportion, as shall be manifested by examples.

Two Merchants haue ventured their monies together, the first laid in 330 li., and the second laid in 150 li., wherewith they haue gained 80 li., the question is, what each of them shal haue of the gaine? In the first row of your Table, adde 330 and 150 together, and they make 480 for your generall diuisor; then in the second row, set 80 li. (the total gaines); in the third and fourth rowes, set 330 and 150, their seueral ventures; then say by the Rule of 3, if 480 li. gaine 80 li., what shall 330 li. gaine? multiplie 80 li. (the totall gaine) by 330, and diuide by 480, and you shall haue 55 li. for the first mans part of the gaine; then say, if 480 li. gaine 80 li., what shall 150 li. gaine? multiplie and diuide, so haue you 25 li. for the second mans parte of the gaine. And this methode are you to obserue in any worke of this nature.

	x.	m.	c.	x.	li.	s.	d.
			4	8	0		
				8	0		
			3	3	0		
			1	5	0		

Two Merchants companie together, the first layeth in so much money as he taketh $\frac{4}{7}$ of the gaine, the second hath laid in 125 li., the question is, what the first Merchant laid into the companie? if the first taketh $\frac{4}{7}$, then the second can haue but $\frac{3}{7}$; therefore say by the Rule of 3, if $\frac{3}{7}$ of the gaine put in 125 li. stocke, what shall $\frac{4}{7}$ put in? your denominators being both like numbers, you may (if you please) worke onely with your numerators.

merators, saying, If 3 giue 125, what shall 4 giue? multiplie and diuide, and you shall find $168\frac{2}{3}$ li., so much ought the first Merchant to haue laid into stocke, taking $\frac{4}{7}$ of the gaine.

Two Merchants haue companied together, the first laid in more by 16 li. then the second, and they haue gained 35 li., whereof the second taketh 14 li., the question is, what each of them put into company? from 35 li. abate 14, and there remaineth 21 li. for the first mans part; whereby appeareth, that by putting 16 li. more into stocke, he hath 7 li. more of the gaine; therefore say by the Rule of 3, If 7 li. gaine be come of 16 li. stock, of what shall come 14 li. gaine? multiplie and diuide, and you shall finde 32 li. for the second mans laying-in, to which if you adde 16 li., you will finde that the first laid in 48 li.

Two Merchants companie together, the first putteth into stocke 240 Chickeenes, the second putteth in 76 li. 13 s. 4 d., with which they haue gained 120 li., of which gaine, the second Merchant taketh 55 li. 4 s. Now I demand what the Chickeene was worth? subtract 55 li. 4 s. frō 120 li., and there remaineth 64 li. 16 s.: then say, if 55 li. 4 s. (which is $^{27}\frac{1}{5}$) bee come of 76 li. 13 s. 4 d. (which is $^{38}\frac{1}{3}$), of what shall 64 li. 16 s. (which is $^{32}\frac{4}{5}$) come? place your $^{27}\frac{1}{5}$, $^{38}\frac{1}{3}$, and $^{32}\frac{4}{5}$, in your Table, thus: then multiplie and diuide, according to the Direct Rule of 3, and you haue 90 li. for your 240 Chickeenes: then say againe, If 240 giue 90, what giues one? put your 90 li. into shillings, and diuide them by 240, so haue you $7\frac{1}{2}$, that is 7 s. 6 d. for the value of each Chickeene.

x.	m.	c.	x.	li.	s.	d.
		2	7	6		5
		2	3	0		3
		3	2	4		5
			9	0		

Two Merchants companie together, the first laieth in twice so much as the second, and 20 li. ouer, and they haue gained 140 li., whereof the second taketh 44 li., I demand what each of them laid into companie? subtract 44 frō 140, so remaineth 96, which is twice 44, and 8 li. ouer for the first mans part; whereby appeareth, that by laying in 20 li. more, he hath 8 li. more of the gaine, therefore say by the Rule of 3, If 8 li. gaine require 20 li. principle, what shall 44 gaine require? multiplie

and diuide, ſo haue you 110 li. for the ſecond mans laying-in, which being doubled, and 20 li. added thereunto, giueth 240 li. for the firſt mans laying-in, which is the anſwere of the queſtion.

Three Merchants companied together, the firſt laied into ſtocke 256 li. 6 s. 8 d.; the ſecond laid in 235 li. 8 s. 4 d.; and the third laid in 186 li. 12 s. 6 d.; with which ſtocke they haue gained 460 li., the queſtion is, what part each of them ought to haue of the gaine? ſet your 256 li. 6 s. 8 d.; 235 li. 8 s. 4 d.; and 186 li. 12 s. 6 d. in three rowes of your Table; then adde them all into the firſt row, and they make 678 li. 7 s. 6 d. for your generall diuiſor. This done, ſet your totall gaines in the ſecond row of your Table, then ſay, If 678 li. 7 s. 6 d. (which is $\frac{1357}{2}$) doe giue $\frac{460}{1}$, what ſhall 256 li. 6 s. 8 d. (which is $\frac{770}{3}$) giue? multiplie and diuide, and you ſhall finde 173 li. 16 s. 4 d. $\frac{868}{1357}$ for the firſt mans part: then ſay againe, If $\frac{1357}{2}$ giue $\frac{460}{1}$, what giues 235 li. 8 s. 4 d. (which is $\frac{705}{3}$)? multiplie and diuide, and the quotient giues you 159 li. 12 s. 8 d. $\frac{776}{1357}$ for the ſecond mans part: yet againe ſay, If $\frac{1357}{2}$ giue $\frac{460}{1}$, what ſhall 186 li. 12 s. 6 d. (which is $\frac{373}{2}$) giue? worke and you ſhall haue 126 li. 10 s. 11 d. $\frac{2783}{2714}$ for the third mans part, which three ſummes, that is to ſay, 173 li. 16 s. 4 d. $\frac{868}{1357}$, 159 li. 12 s. 8 d. $\frac{776}{1357}$, and 126 li. 10 s. 11 d. $\frac{2783}{2714}$, being all added together, do make iuſt 460 li. and thus muſt you doe in all queſtions of this nature how many partners ſoeuer be in company.

Three Merchants companied together, and for euery $\frac{1}{3}$ that the firſt putteth into company, the ſecond laieth in $\frac{4}{9}$, the third $\frac{3}{7}$, and according to thoſe proportions, they part the gaine. Now their whole ſtock was 5285 li., with which they gained 3020 li., the queſtion is, what each man laid into ſtock, and alſo their parts of the gaine? to worke this, or the like, firſt ſet your $\frac{1}{3}$, $\frac{4}{9}$, and $\frac{3}{7}$ in three rowes of your Table, as you haue been taught to place fractions, then reduce them all into one denomination, and you ſhall finde $\frac{315}{1764}$ for your $\frac{1}{3}$, $\frac{784}{1764}$ for your $\frac{4}{9}$, and $\frac{756}{1764}$ for your $\frac{3}{7}$: hauing thus reduced them, reiect your denominators as impertinent, and worke onely vpon your numerators, adding them all three into one totall, ſo haue you 755 for the generall diuiſor, then ſay, if 755 doe giue 5285 (the whole ſtock)

what

what ſhall 315 giue? Multiplie and diuide, ſo haue you 2205 li. for his part of the ſtock that laieth in $\frac{1}{4}$: then ſay againe, If 755 li. doe giue 5285, what ſhall 224 giue? multiplie and diuide, and you haue 1568 li. for his part of the ſtock that laieth in $\frac{4}{9}$. Yet againe ſay, If 755 li. giue 5285 li., what ſhall 216 giue? worke as before, and finde 1512 li. for him that layeth in $\frac{3}{7}$; and thus haue you their due proportions of the ſtock. Now to finde their ſeuerall parts of the gaine, it is in your choyce to take the whole ſtock for your generall diuiſor, and their particular parts for your multipliers, or to vſe the ſame diuiſor and multipliers that you wrought on for the ſtock, both waies you ſhall finde 1260 li. for the firſt, 896 li. for the ſecond, and 864 li. for the third, being their proper parts of 3020 li. which was gained.

Three Merchants companying haue gained 220 li., of which the firſt will haue $\frac{1}{3}$, and 5 li. more: the ſecond will haue $\frac{2}{7}$, and 7 li. ouer: the third will haue $\frac{3}{4}$, and 10 li. more: the queſtion is, what each of them muſt haue of the gaine? abate 5 li. 7 li. and 10 li., that is, 22 li. from 220 li., remaineth 198 li.; then reduce $\frac{1}{3}$, $\frac{2}{7}$, and $\frac{3}{4}$, into one denomination, and you haue $\frac{28}{84}$ for the $\frac{1}{3}$, $\frac{24}{84}$ for the $\frac{2}{7}$, and $\frac{21}{84}$ for the $\frac{3}{4}$; with the numerators of which three fractions (*viz.* 28, 24, and 21) worke as if they were their particular ſtockes, firſt, adding them into one totall, and they make 73 for your generall diuiſor: then ſay, if 73 li. gaine 198 li., what ſhall 28 li. gaine? likewiſe, if 73 li. gaine 198 li. what ſhall 24 li. gaine? alſo if 73 li. gaine 198, what ſhall 21 li. gaine? multiplie and diuide according to your former inſtructions, and you ſhall finde 75 $\frac{52}{73}$ li. for the firſt; 65 $\frac{7}{73}$ li. for the ſecond; 56 $\frac{70}{73}$ li. for the third. Now if you adde 5 li. to the firſt, 7 li. to the ſecond, and 10 li. to the third; then haue you 80 $\frac{62}{73}$ li., 72 $\frac{7}{73}$ li., & 66 $\frac{70}{73}$ li., for the firſt, ſecond and third; whereby all their deſires are ſatisfied: for if you adde thoſe 3 ſummes together, you will finde iuſt 220 li. their firſt totall.

Three Partners laying their ſtockes together, haue gained 300 li., of which the firſt is to haue $\frac{1}{4}$, the ſecond $\frac{2}{5}$, and the third $\frac{4}{9}$: theſe three Partners diſ-agreeing about the ſharing of this gaine, the firſt (deſiring quietneſſe) offereth to abate 8 li. of his part, to ſatisfie the other; the ſecond ſeeing him ſo courte-

ous, abateth 12 li. of his part; and the third (striuing to exceede them both in courtesie) abateth 20 li. of his part: now the question is, what each of them shall haue of the 300 li. gained, making these abatements? Adde 8 li. 12 li., and 20 li., that is 40 li. with your 300 li., so haue you 340 li.; then reduce $\frac{1}{4}$, $\frac{2}{5}$, and $\frac{4}{9}$, into one denomination, and you haue $\frac{45}{180}$ for the $\frac{1}{4}$, $\frac{72}{180}$ for the $\frac{2}{5}$, and $\frac{80}{180}$ for the $\frac{4}{9}$, with the numerators of these fractions, that is, with 45, 72, and 80, worke vpon 340, as you are taught in the former example, so shall you finde, that the first must haue 77 $\frac{131}{197}$ li.; the second 124 $\frac{52}{197}$ li., the third 138 $\frac{14}{197}$ li. Now from the first abate 8 li. from the second 12 li., and from the third 20 li.; so haue you 69 $\frac{131}{197}$ li., 112 $\frac{52}{197}$ li., and 118 $\frac{14}{197}$ li. for their shares, all which maketh iust 300 li. for the proofe of your question.

Foure Merchants companied together, and gained 130 li., of which the first claimeth $\frac{1}{2}$, the second $\frac{1}{3}$, the third $\frac{1}{4}$, and the fourth $\frac{1}{5}$. Now these parts amounting to more then the whole, the question is, what each of them should haue according to these proportions? There is two waies to work this (or any such like) question: first, multiplie each numerator by all the denominators, except his owne, so shall you haue 60 for the first, 40 for the second, 30 for the third, and 24 for the fourth: Or, if you please, thus, multiplie all the denominators one into the other, that is, 5 by 4, again by 3, and again by 2, so haue you 120 for a generall denominator; of which take the $\frac{1}{2}$, the $\frac{1}{3}$, the $\frac{1}{4}$, and the $\frac{1}{5}$, so haue you 60, 40, 30, and 24, as before; so that both waies you see your numbers are agreeable; therefore to finish your worke, adde these foure together, and they make 154 for your generall diuisor; then say, If 154 giue 130, what giues 60? againe, if 154 giue 130, what giues 40? likewise what giues 30? and what giues 24? multiplie and diuide each seuerall operation, and you shall haue 50 $\frac{50}{77}$ li. for the first, 33 $\frac{59}{77}$ li. for the second, 25 $\frac{25}{77}$ li. for the third, 20 $\frac{20}{77}$ for the fourth: all which, if you adde together, maketh 130 li. Thus much for Fellowship without any time limited.

The

The Rule of Fellowſhip with time.

WHerein you muſt obſerue, to multiplie euerie Partners money by the time that it abideth in companie, and thoſe products ſhall be as new layings-in to each Partner; ſo that adding all thoſe products together for your diuiſor, and multiplying the gaines by each product, and diuiding by the ſame diuiſor, ſhall giue you each Partners proportion, according to the money that he layeth in, and alſo to the time that it abideth in company.

Example.

Two Merchants company together, the firſt hath laied in 156 li. for 12 moneths, the ſecond hath laied in 76 li. for nine moneths, wherewith they haue gained 100 li., the queſtion is, what each of them ſhall haue of the gaine? Anſwere. Multiply (in the firſt row of your Table) 156 li. by 12 moneths, and the product will be 1872, for the firſt Merchants new laying-in: then multiplie (in the ſecond row of your Table) 76 li. by 9 moneths, it produceth 684 for your ſecond Merchants new laying in: this done, adde the ſecond into the firſt, ſo haue you 2556 for your generall diuiſor; therefore multiplie 100 li. (your gaines) by 1872, it produceth 187200; which diuided by 2556 (your generall diuiſor) giueth 73 $\frac{17}{71}$ li. for the firſt mans proportion. Againe, multiplie 100 li. by 684, it produceth 68400, which diuided by 2556, giueth 26 $\frac{14}{71}$ li. for the ſecond mans proportion: both which added together, maketh iuſt 100 li. And this is all you are to obſerue, how many partners ſoeuer there be in the Rule of Fellowſhip with time.

Two Merchants companied together, the firſt put in 256 li. 6 s. 8 d. for 12 moneths, the ſecond put in a ſumme of money to continue in company for 7 moneths, and at the concluſion, the ſecond Merchant taketh $\frac{1}{2}$ of the gaine, the queſtion is, what money he put into company? Anſwere, multiplie 256 li. 6 s. 8 d. by 12 moneths, and the product will bee 3076 li. for his laying-in, and ſo much ought the ſecond to lay into companie, taking $\frac{1}{2}$ of the gaine; but for that his money abideth but 7 moneths in company; therefore diuide 3076 by 7, ſo haue

you

you 439 li. 8 s. 6 d. $\frac{6}{7}$ for the ſecond Merchants laying-in, which is the queſtion deſired.

Three Merchants company together, the firſt layeth in 360 li. for 12 moneths, but at the ende of 5 moneths he taketh back 150 li.: the ſecond layeth in 176 li. for 9 moneths, and foure moneths after he putteth in 300 li. more: the third layeth in 400 li. for 7 moneths, & 2 moneths after taketh out 66 li. 8 s.; in concluſion, they haue gained 440 li.; I demand what each of them muſt haue of the gaine? Anſwere. Multiplie 360 li. by 12 moneths, the product will be 4320 li. for the firſt mans laying-in: but for that hee tooke backe 150 li. at the ende of 5 moneths, there wanted ſo much money 7 moneths; therfore multiplie 150 by 7, it produceth 1050 li.; ſubtract that from 4320, remaineth 3270 li. for the firſt mans laying-in. Againe, multiplie the ſecond manes ſtock, that is 176 li. by 9 moneths, the product will be 1584 li.; and becauſe that 4 moneths after he put in 300 li. more, the firſt 300 li. remained in compani 5 moneths, therefore Multiplie in the ſecond row of your Table 300 li. by 5, and adde the product 1500 to the former, ſo haue you 3084 li. for the ſecond mans laying-in. Finally, multiplie 400 li. that the third layeth in by 7 moneths (his time) and you produce 2800 li.: but for that hee wanted 66 li. 8 s. 5 moneths of his time, therefore multiplie 66 li. 8 s. by 5, and ſubtract the product (which is 332 li.) from the former, ſo haue you 2468 li. for the third mans laying-in. Now if you adde theſe three layings-in together, that is, (3270 li., 3084 li., and 2468 li.) you ſhall haue 8822 li. for your generall diuiſor, with which diuiſor, and ſeuerall layings-in, working vpon 440 gained, as in the firſt queſtion of this Rule is taught, produceth 163 $\frac{4027}{4411}$ li. for the firſt; 153 $\frac{3197}{4411}$ li. for the ſecond; 123 $\frac{4027}{4411}$ li. for the third; and thus muſt you doe, whenſoeuer there is ſeuerall layings-in, or takings-out in the Rule of Fellowſhip.

Three Merchants company together, the firſt layeth in 149 li. 8 s., the ſecond layeth in 166 li., and the third layeth 249 li. for 9 moneths; now of the gaine euerie one taketh $\frac{1}{3}$ part, ſo they ſhare it equally, the queſtion is, how long time the firſt and ſecond Merchants monies cõtinued in company? Anſwer

by

by the Rule of 3, If 249 li. require 9 moneths, what ſhall 249 $\frac{2}{3}$ li. require? multiplie and diuide, ſo haue you 15 moneths for the firſt Merchants time. Then ſay againe, If 249 li. require 9 moneths, what ſhall 166 li. require? multiplie and diuide, and finde 13 $\frac{1}{3}$ moneths for the ſecond Merchants time, which is the queſtion demanded.

Three Merchants companied together, the firſt laid in 252 li. for 12 moneths, and taketh after the rate of 8 li. in the 100 li. of the gaines; the ſecond laied in 336 li. for 9 moneths, and he ought to haue 10 li. in the 100 li.; the third laid in 504 li. for 6 moneths, and he muſt haue 12 li. in the 100 li. Now they gained 568 li.: I demand, what each of them muſt haue of the ſaid gaines? Anſwere; multiplie (in the firſt row of your Table) 252 li. by 12 moneths, and againe by 8 li., ſo haue 24192 li. for the firſt Merchants new layings-in. Then (in the ſecond row of your Table) multiplie 336 li. by 9 moneths, and by 10 li., ſo haue 30240 for the ſecond Merchants new layings-in. Againe (in the third row of your Table) multiply 504 li. by 6 moneths, and by 12 li., ſo haue you 36288 li. for the third Merchants new layings-in. This done, adde 24192, 30240, and 36288 all into the firſt row of your Table, and they make 90720 for your generall diuiſor, and 568 li. for your toeall gaines; therefore multiplie the ſaid gaines by the ſeuerall layings-in, and diuide the products by the generall diuiſor, as you are formerly taught, and you ſhall finde 151 $\frac{7}{17}$ li. for the firſt, 189 $\frac{5}{17}$ li. for the ſecond, 227 $\frac{1}{17}$ li. for the third, which added together, maketh 568 li. for the proofe of the queſtion.

The Rule of Fellowſhip betweene Merchants and their Factors.

WHerein is generally obſerued, that the perſon of the Factor, is alwaies proportionable to the ſtock that the Merchant layeth in, as the gaine of the Factor, is vnto the gaine of the Merchant. As if a Merchant deliuer into the hands of a Factor 300 li., and allow him $\frac{1}{3}$ of the gaine, the perſon of the Factor is eſteemed at other 300 li.: but if the Factor take but $\frac{1}{3}$ of the gaine, he taketh but halfe ſo much as the Merchant, ha-

ping $\frac{1}{3}$, therefore his perſon is eſteemed but at $\frac{2}{3}$ of the ſtock, that is 150 li. Likewiſe if the Factor take but $\frac{1}{4}$, then the Merchant taketh $\frac{3}{4}$, ſo the Factors taking is but $\frac{1}{3}$ of that the Merchant taketh: whereby appeareth, that his perſon is eſteemed at $\frac{1}{3}$ of the ſtock, that is at 100 li.

But if the Factor take the $\frac{1}{3}$ of the gaine, then the Merchant taketh $\frac{2}{3}$, ſo the Factor taketh $\frac{1}{2}$ of that the Merchant taketh, for $\frac{1}{3}$ is $\frac{1}{2}$ of $\frac{2}{3}$, ſo the gaine of the Merchant to the gaine of the Factor, is as 2 to 1; wherefore the ſtock being 300 li. the eſtimation of the Factors perſon is 200 li.

But if the Merchant ſhould deliuer to his Factor 460 li. and the Factor to haue halfe the gaine, putteth in 150 li.; the queſtion is, for how much his perſon is eſteemed, in reſpect hee taketh $\frac{1}{2}$ of the gaine, he ſhould lay in other 460 li., therefore abate 150 li. from 460 li. there remaines 310 li. for the eſtimation of his perſon.

And if the Factor would take but $\frac{1}{3}$ of the gaine, his perſon with his money muſt be eſteemed at $\frac{2}{3}$ of the ſtocke; therefore take $\frac{2}{3}$ of 460 li., which is 230 li., from the which abate 150 li., and you haue 80 li. for the eſtimation of his perſon.

But if the Factor will haue $\frac{1}{3}$ of the gaine, then his perſon with his money is eſteemed at twice ſo much as the ſtock, that the Merchant layeth in, becauſe he taketh twice ſo much of the gaine, as the Merchant can haue, $\frac{2}{3}$ vnto $\frac{1}{3}$ being in double proportion; therfore double 460 li., it giueth 920 li., from which abate 150 li., ſo remaineth 770 li. for the eſtimation of his perſon.

A Merchant deliuereth into the hands of his Factor 360 li. to gouerne in the trade of Merchandize, and alloweth him $\frac{1}{4}$ of the gaine for the eſtimation of his perſon; the Factor hoping to thriue thereby, is very deſirous to haue $\frac{1}{2}$ of the gaine; the queſtion is, what money he ought to put in, that he may take $\frac{1}{2}$, his perſon being eſteemed but at $\frac{1}{4}$? Anſwere. For as much as his perſon taketh $\frac{1}{4}$, it taketh $\frac{1}{3}$ of that the Merchant taketh, being but $\frac{3}{4}$; therefore take $\frac{1}{3}$ of the ſtock for the eſtimation of his perſon, and you haue 120 li. then ſay by the Rule of 3, If $\frac{1}{4}$ giue 120 li. what ſhall $\frac{1}{2}$ giue? multiplie and diuide, and you ſhall finde 160 li., from the which abate 120 li., and there remaines

40 li.

40 li., ſo much money the Factor ought to lay in, that hee may take $\frac{1}{3}$ of the gaine: or if you will, adde $\frac{1}{3}$ of the ſtock into the ſtock, that is, 120 li. into 360 li., ſo haue you 480 li., of which take $\frac{1}{3}$, and you haue 160 li. as before; then abate 120 li. from 160 li. and the anſwere is ſtill 40 li. for the money he ought to lay in.

A Merchant deliuereth vnto his Factor 840 li., and the Factor putteth in 200 li., couenanting to haue $\frac{2}{7}$ of the gaine; the queſtion is, at what his perſon is eſteemed? Anſwere, In regard he taketh $\frac{2}{7}$ of the gaine, he taketh $\frac{1}{3}$ of that the Merchant taketh: for $\frac{2}{7}$ is $\frac{1}{3}$ of $\frac{3}{7}$; therefore if he layed in no money, his perſon were eſteemed at $\frac{3}{7}$ of the ſtock; but for that he layeth in 200 li., take the $\frac{2}{7}$ of the ſtocke, that is 840 li., and you ſhall finde 560 li., from which abate 200 li., and ſo haue you 360 li. for the eſtimation of his perſon.

More; A Merchant hath deliuered into the hands of his Factor 840 li., conditioning that he ſhall haue (for his ſeruice) the aduenture of 210 li., as if hee put ſo much more into ſtock, the queſtion is, what part of the gaine the Factor ſhall haue? Anſwere, You muſt adde 210 li. with 840 li., and they make 1050 li.: then ſeeke what proportion 210 li. is of 1050 li., and you ſhall finde it to be $\frac{1}{5}$: whereby appeareth, that the Factor ſhall haue $\frac{1}{5}$ of the gaine, and the Merchant $\frac{4}{5}$. But if the agreements were ſuch, that the Factor ſhould haue the aduenture of 210 li. of the ſaid 840 li., then muſt the Factor haue $\frac{1}{4}$, and the Merchant $\frac{3}{4}$, by reaſon that 210 li. is $\frac{1}{4}$ of 840 li. And this is all the difference betweene Merchants and their Factors, that is, whither the allowance be out of the Factors part of the gaine, or his proportion of the ſtock.

The Rule of Barter or exchanging wares for wares.

TWo Merchants are willing to change their Merchandiſe, the one hath 24 Deuonſhire Kerſies at 5 li. 10 s. the piece; the other hath Grograines at 6 s. the yard; the queſtion is, how many yards of Grograine he ought to giue for his 24 Kerſies, that neither of them be loſers? Anſwere, Firſt, ſee what 24 Kerſies amounte vnto at 5 li. 10 s. the piece, and you ſhall finde

their value to be 187 li.: then say, If 6 s. buy one yard, how many yards shal 187 li. buy me? multiply and diuide according to the Direct Rule of 3, and finde $623\frac{1}{3}$ yards, so many yardes of Grograne ought to be giuen for his 34 pieces of Kersey.

The proofe of the same.

Two Merchants Barter, the one of them hath $623\frac{1}{3}$ yards of Grograine at 6 s. the yard; the other hath Kerseyes of 5 li. 10 s. the piece, the question is, how many pieces of Kersey ought to be giuen for $623\frac{1}{3}$ yards of Grograine? Answere. Set your $623\frac{1}{3}$ in the second row of your Table, and multiplie it by 6, so haue you 3740 s.: likewise (in the first row) reduce 5 li. 10 s., (the price of one Kersey) into shillings, and you haue 110 s.: then say by the Rule of 3 Direct, If one cost 110 s., how many must be had for 3740 s.? multiplie and diuide, and finde 34 Kerseyes, your desire.

Two Merchants Barter, the one of them hath Cambrick of 6 s. 3 d. the elle ready money, but in barter he wil haue 7 s. 6 d.: the other hath Cinamom of 4 s. 4 d. the pound readie money, the question is, at what price he shall sell the pound in barter, that he be no loser? Answere: Say by the Rule of 3 Direct, If 6 s. 3 d. giue 7 s. 6 d. in Barter, what shall 4 s. 4 d. ready money giue in Barter? put your whole numbers into their broken, and set them in 3 rowes of your Table; then multiplie and diuide, and you shall finde $5\frac{7}{25}$ s. for that price ought he to sell the pound of Cinamom in barter.

3.	m.	c.	l.	s.	d.
				6	3
				7	6
				4	4
			1	3	3

The proofe.

Two Barter, the one hath Cinamom of 4 s. 4 d. the pound readie money, and in barter he will haue $5\frac{7}{25}$ s.: the other hath Cambrick, of 6 s. 3 d. the elle readie money, the question is, how he shall sell it in Barter? Answere: by the Rule of 3 Direct, If 4 s. readie money giue $5\frac{7}{25}$ s. in Barter, what shall 6 s. 3 d. giue in Barter? Put your whole numbers into their broken, and place them in the three last rowes of your Table, then

multiplie

multiplie and diuide, ſo haue you 7 $\frac{1}{2}$ s., the anſwere of your queſtion.

Two Barter, the one hath Saffron of 36 s. the pound to ſell for ready money, but in Barter he will haue 45 s. 6 d.; the other hath Broad-cloth of 14 li. the piece, to ſell in Barter: the queſtion is, what his Broad-cloth coſt in ready money? Anſwer by the Rule of 3 Direct, If 45 s. 6 d. in barter giue but 36 s. in ready money, what ſhall 14 li. in Barter giue? multiplie and diuide, and finde 11 $\frac{7}{91}$ li., ſo much did the Broad-cloth coſt in readie money.

The proofe.

Two Barter, the one hath Broad-cloth of 11 $\frac{7}{91}$ li. to ſell for ready money, but in barter he will haue 14 li. the piece, the other hath Saffron, which he deliuereth in barter at 45 s. 6 d. the pound, the queſtion is, what his Saffron coſt in readie money? Anſwere by the Rule of 3 Direct, if 14 li. in Barter be come of 11 $\frac{7}{91}$ li. readie money, of what readie money ſhall come 45 s. 6 d. in Barter; worke and finde 36 s. your deſire.

The Rule of Barter, reſerning ſome part of ready money.

WHerein you muſt obſerue, that if the partie ouer-ſelling his ware, doe alſo require ſome part in readie money, as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or any ſumme of money whatſoeuer, you muſt firſt abate the ſame part or ſumme from the ouer-price, and likewiſe from the iuſt price, and the two numbers remaining, ſhall be the two firſt numbers in the Rule of 3, and the iuſt price of your owne commoditie ſhall be the third number, ſo that working according to the Direct Rule of 3, ſhall reſolue you, at what price to ouerſell your Merchandiſe, ſauing your ſelfe harmleſſe, and making the Barter equall.

Example.

Two Barter, the one hath Raw Silke, of 42 li. the hundred to ſell for ready money, but in Barter he will haue 48 li. the hundred, and yet he will haue $\frac{1}{3}$ of his ouer-price in readie money; the other hath Indicoe of 6 s. 4 d. the pound, the queſtion is, how he ſhall ſell his Indicoe in barter, that he be no looſer? An-

ſwere, take $\frac{1}{3}$ of 48 li. (the ouer-price of the Silke) and you haue 16 li, which 16 pounds abate from 48 pounds, and alſo from 42 li. (the iuſt price of the ſilke) ſo haue you 26 li., and 32 li. for the two firſt numbers in the Rule of 3: then ſay, If $\frac{1}{6}$ li. giue $\frac{1}{20}$ li., what ſhall 6 $\frac{1}{20}$, that is $\frac{121}{20}$ s. giue? place your numbers in three rowes of your Table, then multiplie and diuide, and the quotient giues you 7 s. 9 d. $\frac{7}{11}$, and for ſo much muſt the ſecond ſell the pound of Indicon in Barter, to ſaue himſelfe harmeleſſe.

The proofe.

Two barter, the one hath Raw ſilke of 42 li. the hundred readie money, but in barter hee ſelleth for 48 li. the hundred, and yet he taketh $\frac{1}{3}$ of the ouer-price in ready money: the other hath Indicoe, which he deliuereth in Barter for 7 s. 9 d. $\frac{7}{11}$ the pound: the queſtion is, what his Indicoe coſt in readie money? firſt make your three numbers of 3, as in the former example, ſo haue 26 li. and 32 li. for your two firſt numbers as before: then ſay by the Rule of 3, Diuers 8 li. $\frac{1}{6}$ haue come of $\frac{121}{20}$ li. of what ſhall come 7 s. 9 d. $\frac{7}{11}$, which is $\frac{1221}{176}$ d.? multiplie and diuide, and the quotient bringeth forth 76 d.; which reduced into ſhillings, is 6 s. 4 d. your deſire.

Two barter, the one hath Naples ſilke-ſtockens of 26 s. the paire to ſell for readie money, but in barter he will haue 33 s. 4 d. the paire, & will gaine beſides, after the rate of 10 li. in the 100 li. of money, and yet hee will haue $\frac{1}{3}$ of his ouer-price in ready money: the other hath ribben of 4 d. the yard readie money: the queſtion is how he ſhall ſell the yard in barter? In this and ſuch like queſtions, you muſt firſt looke what the ouer-price commeth too, after 10 li. in the 100 li. gaines, ſaying by the Rule of 3 if 100 li. giue 110 li., what ſhall 33 s. 4 d. (which is $\frac{1}{3}$ li.) giue? multiplie and diuide, and you haue 1 li. 16 s. 8 d. of which the $\frac{1}{3}$ hee requireth in ready money is 9 s. 2 d., therefore abate 9 s. 2 d. from 26 s. (the iuſt price), and alſo from 33 s. 4 d. (the ouer-price), ſo haue you 16 s. 10 d., and 27 s. 6 d. for the two firſt numbers in the Rule of 3: this done, ſay, If 16 s. 10 d. giue 27 s. 6 d., what ſhal 4 d. giue? multiply and diuide, ſo haue you 6 $\frac{81}{101}$ d., for ſo much muſt he ſell the yard of Ribben, to make the barter equall.

Two

Two barter, the one hath Engliſh Hopps of 49 s. the hundred, but in barter he will ſell them for 3 li. the hundred, and yet he will haue the $\frac{1}{2}$ of his ouer-price in readie money; the other hath Iriſh Rugges of 17 s. the piece, but hee would ſell them ſo, that he may equall the barter, and yet gaine after the rate of 12 li. in the 100 li.; the queſtion is, at what rate he ſhal deliuer his Ruggs in barter? Anſwere: Firſt, ſee at 12 li. in the 100 li. what 17 s. doth amount vnto, ſaying by the Rule of 3, If 100 giue 112, what ſhall 17 giue? multiplie and diuide, ſo haue you 19 $\frac{3}{17}$ s.; then take $\frac{1}{2}$ of 3 li. (the ouer-price of the Hopps), being 30 s., and ſubtract it from 49 s. (the iuſt price), and alſo from 3 li. (the ouer-price), ſo haue you 19 s., and 30 s. for the two firſt numbers in the Rule of 3, and 19 $\frac{3}{17}$ s. for the third number: theſe three numbers ſet in three rowes of your Table, and worke by the Direct Rule of three, the quotient giues you 30 $\frac{5}{17}$ s., for ſo much muſt the ſecond deliuer his Rugges the piece, to make the barter equall, and gaine 12 li. in the 100 li. of money.

Two barter, one hath Cloues at 6 s. the pound to ſell for readie money, but in barter he will haue 7 s. 6 d., and that hee may haue $\frac{1}{5}$ of his ouer-price in readie money, he is contented to looſe 10 li. in the 100 li.; the other hath Veluet, which hee deliuereth in barter for 22 s. the yard; the queſtion is, what his Veluet coſt in readie money? Anſwere, firſt, finde by the Rule of Proportion, what 7 s. 6 d. looſeth after the rate of 10 li. in the 100 li., ſaying, If 100 li. looſe his $\frac{1}{10}$, then 7 s. 6 d. muſt looſe his $\frac{1}{10}$, that is 9 d. which 9 d. ſubtracted from 7 s. 6 d., reſteth 6 s. 9 d.: this done, take $\frac{1}{5}$ of 7 s. 6 d. (which he deſireth in ready money) and you haue 2 s. 6 d.; ſubtract that doth from 7 s. 6 d., and alſo from 6 s. 3 d., ſo haue you 5 s. and 4 s. 3 d. for the two firſt numbers in the Rule of three; therefore ſay, If 4 s. 3 d. giue $\frac{1}{2}$ s., what ſhall 22 s. giue? multiplie and diuide, the quotient giues you 18 $\frac{2}{5}$, ſo much did the Veluet coſt in readie money.

Two Merchants barter, one of them hath ſiluer Lace of 5 s. 8 d. the ounce to ſell for ready money, and doth it away in barter for 7 s., and yet will gaine beſides, after the rate of 8 li. in the 100 li.; the other hath Cutchenneale of 17 s. 6 d. the pound.

pound in barter: I demand what the li. of Cutchenneale coſt in readie money? Anſwer: If 7 s. the ouer-price of the Lace bie come of 5 s. 8 d., of what ſhall come 17 s. 6 d.? worke, and you ſhal find $14\frac{1}{2}$ s. Now becauſe the firſt wil gaine after 8 li. in the 100 li., ſay againe, If 100 giue 108, what ſhal $14\frac{1}{2}$ giue? multiplie and diuide, ſo haue you 15 s. $\frac{3}{120}$, ſo much did the pound of Cutchenneale coſt in readie money.

Two Merchants change wares for wares, the one hath 350 faire Turkey Carpets of 7 li. 10 s. the piece to bee ſold for readie money, but in barter he deliuereth them for 9 li. the piece; the other hath Darnaxe of 22 d. the yard, which hee deliuereth in barter for 2 s. 3 d. the yard: the queſtion is, how many yards of Darnax payeth for the 350 Carpets, which, and how much the one gaineth of the other? Anſwere: Firſt, ſeeke what 350 Carpets amounteth too, at 7 li. 10 s. the piece; to doe which, ſet 350 in the firſt row of your Table, in the ſecond row take $\frac{1}{2}$ of it, ſo haue you 175: this done, multiplie the 350 in the firſt row by 7, and adde the ſame $\frac{1}{2}$ into the product, it maketh 2625 li.: or if you will multiplie 350 by 15, and take $\frac{1}{2}$ of that product, both waies giueth 2625 li. for the value of all the Carpets in ready money: then ſee what they come vnto at 9 li. the piece in barter, multiplying 350 by 9, the product is 3150 li.: this done, to know what Darnax payeth for all the Carpets, ſay by the Rule of 3, If 2 s. 3 d. giue 1 yard, how many yards ſhall I haue for 3150 li.? worke, and you haue 28000 yards. Now to find whither he hath gained or loſt, you muſt ſee what 28000 yards are worth at 22 d. the yard; which to know, ſet 28000 in the ſecond row of your Table, and his $\frac{1}{10}$, that is 2800 in the third row, adde theſe together, they make 30800, diuide this by 12, the quotient giues you $2566\frac{2}{3}$ li., and the readie money of the Carpets came to 2625 li. therefore ſubtract the leſſer from the greater, and you ſhall finde, that the Merchant of Darnax hath gained $58\frac{1}{3}$ li. by the barter.

Questions of Exchange.

AT Antwarpe their accounts are nothing differing from the Engliſh, reckoning by Denyers de groſe, that is, by pence

pence Flemiſh, whereof 12 doe make 1 s. Flemiſh, and 20 s. Flemiſh doe make 1 li. degroſe; and notwithſtanding that the pound, or 20 s. Sterling be 23 $\frac{1}{7}$ s. Flemiſh, yet the exchanging of moneyes from one place to another, is allowed as the taker-vp can agree with the deliuerer.

Example.

If I deliuer at Antwarpe 340 li. at 21 s. 6 d. the pound Flemiſh, to receiue 20 s. the pound ſterling at London; I demand how much ſterling money I ſhall receiue at London for my 340 li. Flemiſh? Anſwere, If 21 $\frac{1}{2}$ s., that is $\frac{43}{2}$ doe giue but $\frac{20}{1}$, what ſhall $\frac{340}{1}$ giue? ſet the $\frac{43}{2}$, $\frac{20}{1}$, and $\frac{340}{1}$ in 3 rowes of your Table, multiplie and diuide, the quotient giues you 316 $\frac{12}{43}$ li., which fraction is worth 5 s. 6 d. $\frac{42}{43}$ of a penny.

x.	m.	c.	x.	li.	s.	d.
			4	3		2
			2	0		1
		3	4	0		1

A Merchant taketh vp 316 $\frac{12}{43}$ li. ſterling at London, for which he is to pay 21 s. 6 d. Flemiſh for euery pound ſterling at Antwarpe: the queſtion is, how many pounds Flemiſh he muſt there deliuer for his 316 $\frac{12}{43}$ li. ſterling? Anſwere: ſay by the Rule of 3, If 20 s. giue 21 $\frac{1}{2}$ s., what ſhall 316 $\frac{12}{43}$ li. giue? reduce your whole numbers into fractions, ſo haue you $\frac{20}{1}$, $\frac{43}{2}$, & $\frac{13600}{43}$, ſet theſe three fractions in three rowes of your Table as before, then multiplie and diuide, and you ſhall finde 340 li. Flemiſh, which is a proofe of both queſtions.

A Merchant taketh vp money at London, and for 20 s. ſterling, payeth 22 $\frac{1}{2}$ s. Flemiſh at Antwarpe; and for paiment of the ſame money, his Factor taketh vp money againe at Antwarpe 22 $\frac{1}{2}$ s. Flemiſh, for 20 s. ſterling to bee payed at London, the queſtion is, how much he gaineth or looſeth vpon the 100 li. of money? Anſwere by the Rule of 3, If 22 $\frac{1}{2}$, which is $\frac{67}{3}$, giue 22 $\frac{1}{22}$ which is $\frac{45}{2}$, what ſhall $\frac{100}{1}$ giue? multiplie and diuide, and you haue 100 li. 14 s. 11 d. $\frac{7}{67}$, from which abate 100 li. ſo the cleere gaine is 14 s. 11 d. $\frac{7}{67}$.

If a Merchant take vp moneies in Antwarp, at 23 s. 4. d. the pound Flemiſh, and for euery pound Flemiſh muſt pay 22 s. 6 d. ſterling at London. And when the day of payment is

come, his Factor taketh vp money at London, and for euerie 20 s. sterling is to pay 21 s.3 d. Flemish in Antwarp: the question is, whither he winneth or looseth, and how much vpon the 100 li. of money? Answer by the Rule of 3, If 23 s.4 d. Flemish giue 22 s.6 d. sterling, what Flemish money shall giue 20 s. sterling? work, and you shall finde 20 s.8 d. $\frac{8}{9}$: then say againe, If 21 s. 3 d. which is $\frac{255}{12}$ pence giue but 20 s. 8 d. $\frac{8}{9}$, which is $\frac{2480}{9}$ pence, what shall $\frac{100}{1}$ li. giue? Multiplie and diuide, so haue you 97 li. 12 s.0 d. $\frac{132}{133}$, which abated from 100 li. leaueth 2 li. 7 s. 11 d. $\frac{25}{133}$ of a penny, so much did the said Merchant loose in the 100 li. by the exchange.

The accounts of France is different (both from London and Antwarpe) where they reckon vsually by the French Crowne, which is worth 50 Soulse Tournoyse, and euery Soulse is 12 Deniers Tournoyse, 20 Soulse being one liure, or pound Tournoyse; so that the French Crowne in exchange is allowed for 2 $\frac{1}{2}$ li. Tournoyse, and valued as you can agree with the deliuerer.

Example.

If I deliuer in Parris 2365 li. Tournoyse at 50 Soulse the Crowne, and am to receiue for euery Crowne 6 s.5 d. sterling in London, I demand how many pounds sterling I shal receiue for my 2365 li. Tournoyse? Answere by the Rule of 3, If 2 $\frac{1}{2}$ li. Tournoyse doe giue me 6 $\frac{1}{12}$ s. sterling, what shall $\frac{2365}{2}$ giue? put your whole numbers into their broken, place them in three rowes of your Table, (as you haue often been taught) multiply and diuide, the quotient giues you 6070 $\frac{1}{6}$ s., which reduced into pounds, maketh 303 li. 10 s.2 d., so many pounds sterling must I receiue at London for my 2365 li. Tournoyse, being allowed 6 s.5 d. for euery Crowne of 50 Soulse.

If I deliuer in London 303 li.10 s.2 d., after the rate of 6 s. 5 d. sterling the French Crowne, to receiue at Parris 50 Soulse Tournoyse for euery Crowne, the question is, how many liures or pounds Tournoyse I shall receiue at Parris for the said 303 li. 10 s.2 d. sterling, 50 Soulse being 2 $\frac{1}{2}$ li. Tournoyse? Answere: If 6 $\frac{1}{12}$ s. giue 2 $\frac{1}{2}$ li. Tournoyse, what shall 303 li. 10 s.2 d. giue? reduce your whole numbers into their broken, so haue you $\frac{77}{12}$ s. sterling, $\frac{1}{2}$ li. Tournoyse, and $\frac{3642\frac{1}{2}}{2}$ s. sterling,

ling, theſe three fractions ſtanding in three rowes of your Table, multiplie and deuide, the quotient brings forth 2365 li. Tournoyſe, your deſire, whereby both queſtions are approued.

Queſtions of loſſe and gaine.

A Merchant hath bought Holland for 4 s. 8 d. the ell, and ſelleth it againe for 5 s. 6 d. the elle, I demand what hee hath gained in 100 li. laying out? Say by the Rule of 3, If $4\frac{2}{3}$ s. (which is $\frac{14}{3}$) giue $5\frac{1}{2}$ s. (which is $\frac{11}{2}$), what ſhall $\frac{100}{1}$ li. giue? multiply and diuide, ſo haue you 117 li. 17 s. 1 d. $\frac{5}{7}$, from which abating 100 li. the cleare gaines is 17 li. 17 s. 1 d. $\frac{5}{7}$, ſo much is gained in the 100 li. laying out at the rates aforeſaid. Or, if you pleaſe, thus; ſubtract 4 s. 8 d. from 5 s. 6 d., remaineth 10 d. then ſay, If 4 s. 8 d. (which is $\frac{14}{3}$ s.) gaine 10 d. (which is $\frac{1}{6}$ s.), what ſhall $\frac{100}{1}$ gaine? worke as before, and you ſhall find 17 li. 17 s. 1 d. $\frac{5}{7}$, as in the former worke.

A Merchant hath bought Damask for 9 s. 4 d. the yard, and ſold it againe, ſo that hee hath gained after the rate of 16 li. 12 s. 6 d. in the 100 li. of money, the queſtion is, at what rate hee ſold the yard of Damask? Anſwere: adde 16 li. 12 s. 6 d. to 100 li., they make 116 li. 12 s. 6 d. Then ſay by the Rule of 3, If $\frac{100}{1}$ li. giue 116 li. 12 s. 6 d. (which is $\frac{233}{2}$ li.) what ſhall 9 s. 4 d. (which is $\frac{28}{3}$ s.) giue? multiplie and diuide, the quotient giues you 10 s. 10 d. $\frac{31}{50}$: for ſo much hee ſold the yard of Damask.

A Merchant hath ſold Satten for 13 s. 8 d. the yard, wherein he hath gained after the rate of 21 li. 10 s. in the 100 li. laying out, I demand what the ſatten coſt at the firſt hand? Anſwere: adde 21 li. 10 s. (your gaines) to 100 li., all maketh 121 li. 10 s.: then ſay by the Rule of three, If 121 li. 10 s. giue but 100 li. what ſhall 13 s. 8 d. giue? put your whole numbers into their broken, place them in three rowes of your Table; then multiplie and diuide, the quotient giues you 11 s. 2 d. $\frac{238}{242}$, ſo much did the yard of Satten coſt at the firſt hand.

If I buy an elle of Taffatie for 12 s. 4 d., and bee content to ſell it againe, looſing after the rate of 9 li. in the 100 li., the

queſtion is, at what price I ought to ſell it? Anſwer: ad 9 li. to 100 li., maketh 109 li.; then ſay by the Rule of 3, If $\frac{109}{1}$ giue but $\frac{100}{1}$, what ſhal 12 s.4 d. (which is $\frac{37}{3}$ s.) giue, multiply and diuide, ſo haue you 11 s.3 d. $\frac{81}{109}$, for ſo much muſt the elle of Taffaty be ſold, to looſe after the rate of 9 li. in the 100 li. of money.

A Merchant hath ſold Cambricks for 470 li., wherein hee hath gained 47 li. I demand what hee gained in the 100 li.? Anſwere: ſubtract 47 li. from 470 li., remaineth 423 li.: then ſay, If 423 li. gaine 47 li., what ſhall 100 li. gaine? worke, and you ſhall finde 11 li. 2 s. 2 d. $\frac{94}{141}$, ſo much hath he gained in the 100 li.

If 27 $\frac{1}{5}$ yards coſt 15 li. 6 s. 8 d., at what rate ſhall I ſell one yard, to gaine $\frac{1}{5}$ of my principall, or (which is all one) to make 5 7? ſay by the Rule of 3, if 5 giue 7, what 15 $\frac{1}{3}$ li.? worke and find 21 $\frac{7}{15}$ li.: this done, ſay againe, If 27 $\frac{1}{5}$ yards giue 21 $\frac{7}{15}$ li., what ſhal 1 yard giue, multiply and diuide, the quotient brings forth 15 s. 9 d. $\frac{7}{17}$.

If 1 ounce of Ciuet, coſt mee 7 s. 9 d., and I ſell the pound waight for 5 li. 17 s. 6 d., the queſtion is, whether I gaine or looſe, and how much vpon the 100 li. of money? Anſwer: firſt, ſee what 16 ounces come to, at 7 s. 9 d. the ounce, and you you ſhall finde 6 li. 4 s., and I ſold it but for 5 li. 17 s. 6 d., whereupon I haue loſt by the bargaine 6 s. 6 d.: then to know what is loſt in the 100 li., ſay by the Rule of three, If 6 li. 4 s. doe looſe 6 s. 6 d., what ſhall 100 li. looſe? multiplie and diuide, ſo haue you 5 li. 4 s. 10 d. $\frac{2}{31}$, ſo much is loſt vpon the 100 li. of money.

If 16 $\frac{1}{3}$ yards of Cloth coſt mee 6 li. 5 s., and I ſell it againe for 9 s. the yard, I demand how much I ſhall winne or looſe vpon the 100 li. of money? Anſwere: firſt, ſee what the 16 $\frac{1}{3}$ yards doe come to at 9 s. the yard, and you ſhall finde 7 li. 8 s. 6 d., and they coſt me but 6 li. 5 s.: ſo that I haue gained in the whole 1 li. 3 s. 6 d.: then to know what I haue gained in the 100 li., ſay by the Rule of three, If 6 $\frac{1}{4}$ li. gaine 1 li. 3 s. 6 d., what ſhall 100 li. gaine? multiplie and diuide, the quotient glues you 18 $\frac{4}{7}$ li., ſo much is gained in the 100 li. of money.

If 1 yard of Veluet coſt me 22 $\frac{1}{2}$ s., for what ſhall I ſell 14 $\frac{3}{4}$ yards,

yards, that I may gaine 13 li. 6 s. 8 d. in the 100 li.? Answere: adde 13 li. 6 s. 8 d. to 100 li., they make 113 $\frac{1}{3}$ li.: then say, If 100 li. giue 113 $\frac{1}{3}$, what shall 22 $\frac{1}{2}$ s. giue? multiplie and diuide, and you shall finde 25 $\frac{1}{2}$ s.: then say againe, If 1 yard giue 25 $\frac{1}{2}$ s. what giue 14 $\frac{1}{4}$ yards? worke and finde 18 li. 16 s. $\frac{1}{2}$, so much must the 14 $\frac{1}{4}$ yards bee sold for, to gaine 13 $\frac{1}{3}$ li. in the 100 pound.

If 14 $\frac{1}{4}$ yards of Veluet be sold for 18 li. 16 $\frac{1}{2}$ s., wherein is gained after the rate of 13 $\frac{1}{3}$ li. in the 100 li., I demand what the yard cost at the first? Answere: If 14 $\frac{1}{4}$ yards giue 18 li. 16 $\frac{1}{2}$ s., what 1 yard? multiplie and diuide, and you shall finde 25 $\frac{1}{2}$ s.: then say againe, If 113 $\frac{1}{3}$ li. giue but 100 li., what shall 25 $\frac{1}{2}$ s. giue? worke, and you haue 22 $\frac{1}{2}$ s., the iust price of the yard at the first hand.

If I buy cloues for 5 s. 6 d. the pound, I demand how I shall sell the ounce, that I may gaine 1 s. 2 d. in the pound waight? adde 1 s. 2 d. to 5 s. 6 d., all maketh 6 s. 8 d.: then say, If 12 ounces giue 20 s., what shall 1 giue? worke, and you shall finde 5 d., for so much must I sell the ounce, to gaine 1 s. 2 d. vpon the pound waight.

Losse and gaine vpon time wrought by the Double Rule of 3. or the Rule of 3 composed.

IF I buy one elle of Sarsenet for 6 s. 9 d., and sell the same againe for 7 s. 4 d. gining 5 moneths day of paiment, the question is, what I shall gaine in the 100 li. for 12 moneths? Answere by the double Rule of 3, If 6 s. $\frac{1}{20}$ doe gaine $\frac{7}{240}$, what shall $\frac{100}{1}$ li. gaine? multiplie and diuide, so haue you 8 $\frac{12}{11}$ li.: this done, say againe, If 5 moneths giue 8 $\frac{12}{11}$ li., what shall 12 moneths giue? put your whole numbers into broken, and you haue $\frac{5}{1}$, $\frac{700}{11}$, and $\frac{12}{1}$; set these in three rowes of your Table, worke, and finde 20 $\frac{20}{77}$ li., which fraction is worth 14 s. 9 d. $\frac{7}{9}$, so much is gained in the 100 li. for 12 moneths.

Or if you will worke it by the Rule of 3 Composed, you must then propound it thus, If 6 s. 9 d. in 5 moneths doe gaine 7 d., what shall 100 li. gaine in 12 moneths? place your numbers.

bers in fractions thus: then multiplie the firſt by the ſecond, that is, $\frac{27}{4}$ by $\frac{5}{7}$, the product will be $\frac{135}{4}$ for your diuiſor. Againe, multiplie $\frac{7}{12}$ by $\frac{100}{1}$, and by $\frac{12}{12}$, ſo haue you $\frac{2400}{12}$ for diuidend. Finally, diuide $\frac{2400}{12}$ by $\frac{135}{4}$, the quotient giues you 20 $\frac{20}{27}$ li., as before.

x.	m.	c.	x.	li.	s.	d.
			2	7		4
				5		1
				7	1	2
		1	0	0		1
			1	2		1

But if you obſerue this laſt operation, you will find, that you are to multiplie 7 by 12, and then by 100, to make your diuidend, and afterwards you are to multiply 135, the numerator of your diuiſor by 12 alſo, therefore omit the two multiplications by 12, and onely multiplie 7 the numerator of your gaines, by 4 the denominator of your diuiſor, and againe by 100, ſo haue you 2800: this diuide by 135 (the numerator of your diuiſor) the quotient will be 20 $\frac{20}{27}$ li., as in the workes aforegoing, and thus may you alwaies doe, for more breuitie of working, when you finde that your diuiſor and diuidend are both to be multiplied by one and the ſame number.

If I elle of Sarſenet coſt me 6 s. 9 d., for what price muſt I ſell it againe, to be paid at the ende of 5 moneths, ſo that I may gaine 20 $\frac{20}{27}$ li. vpon the 100 li. in 12 moneths? anſwere by the double Rule of 3, or by the Rule compoſed, If 100 li. in 12 moneths doe gaine 20 $\frac{20}{27}$ pound, what ſhall 6 s. 9 d. gaine in 5 moneths?

$\frac{100}{1}$ li. $\frac{12}{1}$ mon. $\frac{540}{27}$ li. $\frac{27}{4}$ s. $\frac{5}{1}$ mon.

Multiplie the firſt number by the ſecond, that is, 100 by 12 maketh $\frac{1200}{1}$ for your diuiſor; then obſerue that you haue 27 both in the numerators, and in the denominators of your other three numbers, therefore omit 27 in both places, and multiplie 560 by 5 onely for numerator, and 4 onely by 1 for denominator; ſo haue you $\frac{2800}{4}$ for your diuidend. Finally, diuide $\frac{2800}{4}$ by $\frac{1200}{1}$, the quotient giues you $\frac{7}{12}$ s, that is 7 d.; which added with 6 s 9 d., maketh 7 s. 4 d., the iuſt price that you ought to ſell at, if you will gaine as afore ſaid.

But if you will worke this, or the like queſtion by the double Rule

Rule of 3, ſay firſt, If $\frac{100}{7}$ li. do gaine $\frac{50}{21}$ li., what ſhal $\frac{27}{4}$ s. gaine? multiplie and diuide, ſo haue you $1\frac{3}{7}$ s.: then ſay againe, If 12 moneths doe gaine $1\frac{1}{3}$ s., what ſhall 5 moneths gaine? worke and finde $\frac{7}{12}$ s. as before.

If one yard of Satten coſt 12 s. 6 d., and is ſold againe for 13 s. 8 d., the queſtion is, what time of payment ought to bee giuen, ſo that I may gaine after the rate of 32 li. in the 100 li. for 12 moneths? ſay by the ſecond part of the Rule compoſed, If 100 li. in 12 moneths do gaine 32 li. in how many moneths ſhall 12 s. 6 d. gaine 1 s. 2 d.? place your numbers in fractions, thus. Then multiplie the third number by the fourth, that is $3\frac{2}{7}$ by $2\frac{5}{3}$, ſo haue you $\frac{80}{21}$, or $\frac{400}{7}$ for your diuiſor: then multiplie the other three numbers, that is $\frac{100}{7}$ li., $\frac{12}{7}$ mo. and $\frac{7}{6}$ s. one into the other, and they make $\frac{3400}{6}$, or $\frac{1400}{7}$ for your diuidend. Finally, diuide 1400 by 400, the quotient giues you $3\frac{1}{2}$ moneths, the iuſt time that the yard of Satten ought to bee deliuered at, for 13 s. 8 d. to gaine after the rate of 32 li. in the 100 li. for 12 moneths. But if you will worke this, or the like queſtion by the Double Rule of 3, ſay firſt, If 12 s. 6 d. (which is $\frac{25}{2}$ s.) doe gaine 1 s. 2 d. (which is $\frac{7}{6}$ s.) what ſhall $\frac{100}{7}$ li. gaine? worke and finde $9\frac{1}{3}$ li.: then ſay againe, if $3\frac{2}{7}$ li. giue $1\frac{2}{7}$ moneths, how many moneths ſhall $9\frac{1}{3}$ (which is $\frac{28}{3}$ li.) giue? worke and finde $3\frac{1}{2}$ moneths as before.

x.	m.	c.	x.	li.	s.	d.
		1	0	0		1
			1	2		1
			3	2		1
			2	5		2
				7		6

If 1 yard of Satten be deliuered for 13 s. 8 d. to be paid at $3\frac{1}{2}$ moneths, wherein is gained after the rate of 32 li. in the 100 li. for 12 months, the queſtion is, what the ſaid Satten coſt at the firſt hand? Anſwere by the double Rule of 3, If $1\frac{2}{7}$ moneths gaine $3\frac{2}{7}$ li., what ſhall $3\frac{1}{2}$, or $\frac{7}{2}$ moneths gaine? multiplie and diuide, ſo haue you $9\frac{1}{3}$ li.: then ſay againe, If $109\frac{1}{3}$ (which is $3\frac{28}{3}$) giue but $\frac{100}{1}$, what ſhall 13 s. 8 d. (being $4\frac{1}{3}$ s.) giue? worke and finde 12 s. 6 d. your deſire.

If one elle of Holland coſt mee 4 s. 9 d., at what rate ſhall I ſell the ſame to be paid for at the end of $4\frac{1}{2}$ moneths, to gaine

16 li.

16 li. in the 100 li. for 12 moneths? Answere by the Double Rule of 3. If 12 moneths gaine 16 li. what shall 4 $\frac{1}{2}$ gaine? worke, and you shall finde 6 li.; then say againe, If $^{100}\frac{1}{1}$ li. giue $^{10}\frac{1}{4}$ li., what shall 4 s. 9 d. (which is $^{1}9\frac{1}{4}$) giue? worke, and you haue 5 $\frac{7}{200}$ s., for so much must the elle bee sold, to gaine 16 li. vpon the 100 li. for 12 moneths.

Rules of payment.

A Merchant is indebted 560 li., whereof he is to pay $\frac{1}{2}$ at 5 moneths; $\frac{2}{7}$ at 8 moneths; and the rest, which is $\frac{1}{10}$, at a yeere; the question is, what time must be giuen him to pay it altogether? for the solution of this, and such like questions, you must multiplie euery paiment by the time that it is to bee paide in, and then adding al the products together, maketh the iust time of paiment. As if you multiplie $\frac{1}{2}$ by 5, maketh $\frac{5}{2}$, then $\frac{2}{7}$ by 8, giueth $^{1}\frac{6}{7}$. Lastly, $\frac{1}{10}$ by 12, giueth $\frac{12}{10}$, these three thus wrought in three rowes of your Table, reduce them into their whole numbers, that is 2 $\frac{1}{2}$, 3 $\frac{2}{7}$, 1 $\frac{1}{7}$; being thus reduced, adde them together, and they make 6 $\frac{3}{10}$ moneths; at which time, he ought to pay the whole summe together.

A Merchant is to pay 840 li. the $\frac{1}{7}$ in ready money, $\frac{1}{7}$ at two moneths, $\frac{1}{4}$ at 6 moneths, and the rest at a yeere: I demand what the rest is, and at what time it should bee paid altogether? Answere: set the $\frac{1}{7}, \frac{1}{4}, \frac{3}{5}$ in three rowes of your Table, and reducing them into one denomination, adde them all together, so haue you $\frac{109}{140}$; whereby you perceiue, that there rest $\frac{31}{140}$ for the last paiment; now to finde what time must bee giuen, for the paiment of the whole debt together, obserue, that the ready money is neuer multiplied, then $\frac{1}{7}$ at two moneths, maketh $\frac{2}{7}$, $\frac{1}{4}$ by 6 moneths maketh $^{1}\frac{2}{4}$, that is 2 $\frac{1}{4}$, and $\frac{11}{140}$ by 12 moneths, maketh $\frac{132}{140}$, that is 1 $\frac{1}{10}$. Finally, if you adde $\frac{2}{7}$, 2 $\frac{1}{4}$, and 1 $\frac{1}{10}$ together, you will finde 4 $\frac{1}{60}$, that is about Noone, the first day, of the fifth moneth, at which time hee ought to pay the whole 840 li. together.

A Merchant is to pay 960 li. at three paiments, that is to say, 300 li. at three weeks, 450 li. at 7 moneths, and the rest, which is 210 li. at 10 $\frac{1}{2}$ moneths: If hee would pay it all at once, the question

queſtion is, what time ought to be giuen him? abbreuiate 300 li. with 960 li., and you haue $\frac{5}{16}$ of the principall for the firſt paiment. Likewiſe 450 li. abbreuiated with 960 li., giueth $\frac{15}{32}$ of the principall, and 210 li. in like manner is $\frac{7}{32}$; theſe three numbers $\frac{5}{16}$, $\frac{15}{32}$, and $\frac{7}{32}$, place in three rowes of your Table, and multiplie euery number by his time, that is, $\frac{5}{16}$ by $\frac{1}{4}$ of a moneth maketh $\frac{15}{64}$, then $\frac{15}{32}$ by 7 moneths maketh $\frac{105}{32}$: but we will rather haue it $\frac{210}{64}$, that all our parts may bee of one denomination. Againe, $\frac{7}{32}$ by $10\frac{1}{2}$ moneths, yeeldeth $\frac{147}{64}$ and now haue you in the three rowes of your Table $\frac{15}{64}$, $\frac{210}{64}$, and $\frac{147}{64}$. Now to finiſh the worke, adde your three numerators together, and they make 372; and becauſe your denominators are all like numbers, that is 64, therefore diuide the ſaid 372 by 64, and the quotient giues you $5\frac{13}{16}$ moneths, at which time he ought to pay the whole debt together. And this may you obſerue for a generall rule, whenſoeuer your fractions are of one denomination.

Buying and ſelling vpon time, with diuers dayes of paiment, and alſo what is wonne or loſt by the bargaine.

A Merchant buyeth Chamlets at 5 s. 4 d. the yard, and ſelleth it againe for 5 s. 9 d. the yard, giuing two dayes of paiment, that is to ſay, 5 moneths for the $\frac{1}{3}$, and 7 moneths for the other $\frac{2}{3}$: I demaund what he gaineth in the 100 li. for 12 moneths? Anſwere: firſt, ſubtract 5 s. 4 d. from 5 s. 9 d., remaineth 5 d. for the gaines preſent. This done, ſeeke by the Rules of paiment aforegoing, at what time it ſhould all be paid at once, multiplying $\frac{1}{3}$ by 5 moneths, maketh $\frac{5}{3}$, and $\frac{2}{3}$ by 7 moneths, maketh $\frac{14}{3}$: then adde your two numerators together, and they make 19, which 19 diuide by 3, the denominator to both, and you haue $6\frac{1}{3}$ moneths, for the iuſt time of paiment. This being found, ſay by the Rule of 3 Compoſed, If 5 s. 4 d. in $6\frac{1}{3}$ moneths gaine 5 d. what ſhal 100 li. gaine in 12 moneths? multiplie and diuide, and you ſhall finde 14 li. 16 s. $4\frac{4}{19}$, ſo much the ſeller hath gained in the 100 pound for twelue moneths.

A Merchant buyeth silke Grograine for 9 s. 9 d. the yard, and selleth it againe for 10 s. 5 d., to be paid the $\frac{2}{6}$ in ready money, $\frac{2}{7}$ at 4 moneths, $\frac{1}{7}$ at 7 moneths, and the rest, which is $\frac{11}{60}$, at 10 moneths: I demaund what he gaineth in 30 li. laying out for 12 moneths? Answere; first, see the difference betweene the iust price, and the ouer-price, and you will find 8 d. gained; then seeke the iust time, wherein it should all be paied at once, omitting (as you are taught before) the readie money; and multiplying $\frac{2}{7}$ by 4 moneths, maketh $\frac{8}{7}$, then $\frac{1}{7}$ by 7 moneths, giueth $\frac{7}{7}$; Lastly, $\frac{11}{60}$ by 10 moneths, yeeldeth $\frac{110}{60}$; these three fractions, $\frac{8}{7}$, $\frac{7}{7}$, and $\frac{110}{60}$ standing in three rowes of your Table, reduce them all into one denomination, and you shall finde $\frac{192}{120}$, $\frac{210}{120}$, and $\frac{220}{120}$; then adde all the numerators together, and they make 622; which totall diuide by 120, the generall denominator, so haue you $5\frac{22}{120}$ moneths for the certaine time of paiment. Now to finde the true solution of the question, say by the Rule of 3 Composed, If 9 s. 9 d. in $5\frac{22}{120}$ moneths doe gaine 8 pence, what shall 30 li. gaine in 12 moneths? place your numbers orderly in your Table, reduce them into their broken numbers, multiplie and diuide, and you shall finde 4 li. 14 s. 11 d. $\frac{1023}{4043}$ of a penny, so much hath hee gained by his 30 pound in twelue moneths.

A Merchant hath sold 120 yards of Scarlet at 3 li. 5 s. the yard, to be payed $\frac{1}{7}$ at 2 moneths, $\frac{3}{7}$ at 5 moneths, and the rest, which is $\frac{3}{21}$, at 8 moneths, and determineth to gaine after the rate of 12 li. in the 100 li. for 12 moneths: the question is, what he gaineth by all his Scarlet after that rate? Answere: first, see what the 120 yards at 3 li. 5 s. the yard amounteth vnto, and you will finde 390 li., then see at what time all the paiment are to be made, as you are taught in the former question, and you shall finde $5\frac{1}{7}$ moneths. Lastly, say by the Rule of 3 composed, If 100 li. in 12 moneths doe gaine 12 li., what will 390 li. gaine in $5\frac{1}{7}$ moneths? multiplie and diuide, and you shall finde 20 li. 1 s. 1 d. $\frac{1}{7}$, so much hath the said Merchant gained by all his Scarlet, after the rate of 12 li. in the 100 li. for 12 moneths.

A Merchant hath bought 40 yards, cloath of gold, at 4 li. 5 s. the yard, readie money, and he selleth 12 of them for 4 li. 8 s. the

8 s. the yard, to be paied in three moneths; more, 14 yards at 4 li. 12 s. the yard, to be paied at 7 moneths, and the other 14 yards for 4 li. 14 s. the yard, to bee paid at 11 moneths: the queſtion is, what hee gaineth in the 100 li. for 12 moneths? Anſwere: firſt, ſee what the 40 yards commeth to, at 4 li. 5 s. the yard, and you will finde 170 li., then 12 yards at 4 li. 8 s., giueth 52 li. 16 s.: 14 yards at 4 li. 12 s., amounteth to 64 li. 8 s. Againe, 14 yards, at 4 li. 14 s. the yard, yeeldeth 65 li. 16 s.: theſe three added together, maketh 183 li., which is 13 li. more then 170 li. for the gaine preſent: this done: proportionate each value with the totall, firſt 52 li. 16 s., which is $\frac{264}{915}$ of 183 li.; then 64 li. 8 s. is $\frac{322}{915}$; and 65 li. 16 s. is $\frac{329}{915}$: being thus proportioned, multiplie each numerator by his time, firſt 264 by three moneths giueth $\frac{792}{915}$: ſecondly, 322 by 7 moneths, yeeldeth $\frac{2254}{915}$. Laſtly, 329 by 11 moneths, giueth $\frac{3619}{915}$. Now to know the iuſt time, adde theſe three numerators together, and they make 6665; which diuided by 915 the generall denominator, giueth $7\frac{230}{915}$ moneths for the iuſt time that all the paiments ſhould be made together; therfore ſay by the Rule of 3 Compoſed, If 170 li. in $7\frac{230}{915}$ moneths doe gaine 13 li. what ſhall 100 li. gaine in 12 moneths? worke, and you ſhall find, 12 li. 11 s. 11 d. $\frac{10992}{22667}$, ſo much hath he gained, in the 100 li. for 12 moneths at the rates aforeſaid.

A Merchant hath bought Cloues at 4 s. 6 d. the pound ready money: the queſtion is, how he ſhould ſell the 112 li. waight, to be paide the $\frac{1}{3}$ at 4 moneths, and the other $\frac{2}{3}$ at 9 moneths, ſo that he may gaine after the rate of 16 li. in the 100 li. for 12 moneths? Anſwere: firſt, ſeeke at what time both the paiments ought to be made, and you will finde $7\frac{1}{3}$ moneths; then ſay by the Rule of 3, If 12 moneths doe gaine 16 li., what will $7\frac{1}{3}$ moneths gaine? worke, and you will finde $9\frac{7}{9}$ li.: then ſay againe, if one pound coſt 4 s. 6 d., what ſhall 112 li. coſt? work and finde $25\frac{1}{5}$ li. Laſtly, ſay yet againe, If 100 li. doe giue $109\frac{7}{9}$ li., what ſhall $25\frac{1}{5}$ li. giue? multiplie and diuide, and you haue 27 li. 13 s. 3 d. $\frac{9}{27}$, for ſo much muſt hee ſell the 112 li. waight, to gaine after the rate of 16 li. in the 100 li. for twelue moneths, giuing two daies of paiment as aforeſaid.

Queſtions of Tares and Allowances.

AT 9 li. the 100 Suttell, what ſhall 765 pound bee worth, in giuing foure pound vpon euery 100 for treat? Anſwer? adde 4 to 100 maketh 104; then ſay by the Rule of 3, If 104 coſt 9 li., what ſhall 765 coſt? multiplie and diuide, and finde 66 li. 4 s. $\frac{1}{26}$, ſo much ſhall the 765 li. waight coſt.

At 2 s. 9 d. the pound waight, what ſhall 894 li. waight bee worth, giuing 4 li. vpon euery 100 for treate? firſt, ſee what 100 is worth at 2 s. 9 d. the pound, adding to 100 his $\frac{1}{10}$ part, and taking the $\frac{1}{8}$ of 110, ſo haue you 13 li. 15 s.: then ſay by the Rule of 3, If 104 bee worth 13 $\frac{3}{4}$ li. what ſhall 894 bee worth? multiplie and diuide, and you ſhall finde 118 pound, 3 s. 11 d. $\frac{4}{13}$.

If 100 li. waight be worth 2 li. 9 s., what ſhal 850 li. waight be worth, abating 4 li. vpon the 100 li. for tare and cloſe? Anſwere: ſet 850 li. in the ſecond row of your Table, in the third row point two places lower, and multiplie 8 by 4 maketh 32. Againe, point two places beneath 5, and multiplie 5 by 4, it giueth 20, ſo haue you in all 34; ſubtract that 34 from 850, remaineth 816: then ſay by the Rule of 3, If 100 li. waight giue 49 s. what ſhall 816 li. waight giue? multiplie and diuide, the quotient giues you 899 $\frac{21}{25}$ s., which in his proper value, is 44 li. 19 s. 10 d $\frac{21}{25}$, ſo much will the 850 li. waight coſt at that rate, abating 4 li. vpon the 100 for tare and cloſe.

If 1 li. waight of Hoppes coſt me 3 d. $\frac{1}{25}$, what muſt I pay for 678 li. waight, abating 4 li. vpon the 100 li. for tare and cloſe? Anſwere? ſet 678 li. in the ſecond row of your Table, and multiplie it by 4, the product will bee 2712, diuide that by 100; the quotient giues you 27 $\frac{3}{25}$ li., abate that from 678 li. remaineth 650 $\frac{22}{25}$ li.: then ſay by the Rule of 3, If $\frac{1}{7}$ li. waight coſt $\frac{7}{2}$ pence, what muſt I pay for 650 $\frac{22}{25}$, which is $\frac{1}{6}$ $\frac{72}{25}$? multiplie and diuide, and you ſhall finde 9 li. 9 s. 10. $\frac{2}{7}$, ſo much muſt be payed for 678 li. abating 4 vpon the 100 for tare and cloſe.

Whither doth hee looſe more that giueth 4 li. vpon the 100 li. or hee that abateth 4 li. in the 100 li.? Anſwere: hee which giueth 4 li. vpon the 100 li., giueth 104 for a 100 li., and

and he that abateth 4 li. in the 100 li., giueth the 100 for 96; therefore ſay by the Rule of 3, If 104 bee giuen for 100, for what ſhall 100 bee giuen? Multiplie and diuide, and you haue $96\frac{3}{13}$, whereby appeareth, that hee which giueth the 100 for 96, looſeth more by $\frac{3}{13}$ in the 100, then he which giueth 104 for 100.

Queſtions of Lengths and Bredthes.

IF a piece of Tapiſtrie be $9\frac{3}{7}$ elles long, and $2\frac{1}{4}$ elles broad, the queſtion is, how many ſquare elles are contained in that piece? Anſwere: multiplie $9\frac{3}{7}$ by $2\frac{1}{4}$, and the product will be $\frac{1}{28}\frac{19}{12}$; ſo that diuiding the numerator by the denominator, that is 319 by 12, giueth $26\frac{7}{12}$, ſo many ſquare elles is contained in the ſaid piece.

If a piece of Tapiſtrie doe containe $26\frac{7}{12}$ ſquare elles, and be in bredth $2\frac{1}{4}$ elles, the queſtion is, what length the ſaid piece doth containe? Anſwere: diuide $26\frac{7}{12}$ by $2\frac{1}{4}$, the quotient giues you $9\frac{3}{7}$ for the anſwere of the queſtion.

If a piece of cloth be $11\frac{1}{2}$ yards in length, and $1\frac{3}{4}$ yard in bredth, I demaund how many yards of $\frac{4}{7}$ in bredth wil the ſaid piece containe? Anſwere: multiplie $11\frac{1}{2}$ (being $\frac{23}{2}$) by $1\frac{3}{4}$, (which is $\frac{7}{4}$), and you produce $\frac{161}{8}$ of a ſquare yard: then diuide $\frac{161}{8}$ by $\frac{4}{7}$, and the quotient will be $\frac{1127}{32}$, which is $25\frac{27}{32}$ vnities, ſo many yards of $\frac{4}{7}$ broad will $11\frac{1}{2}$ in length, and $1\frac{3}{4}$ in bredth containe.

If one Bolt of Holland containe $27\frac{5}{6}$ elles Flemiſh, I demaund how many elles Engliſh the ſaid Bolt containeth? Anſwere: note that one elle Flemiſh is but $\frac{3}{5}$ of an elle Engliſh, ſo that 5 elles Flemiſh, is but 3 elles Engliſh; therefore ſay by the Rule of 3, If 5 giue 3, what ſhall $27\frac{5}{6}$ giue? Multiplie and diuide, ſo haue you $16\frac{7}{10}$ elles Engliſh.

At 5 s. 6 d. the ſquare yard, what muſt I pay for a piece of Arras, that is $19\frac{3}{7}$ yards in length, and $3\frac{4}{7}$ yards in bredth? Anſwer: multiplie $19\frac{3}{7}$ by $3\frac{4}{7}$, and the product will be $\frac{4757}{217}$, that is by Reduction $70\frac{47}{217}$ yards ſquare: then ſay by the Rule of 3, If 1 ſquare yard be worth 5 s. 6 d. what ſhal $70\frac{47}{217}$ ſquare yards be worth? worke, and you ſhall finde 19 li. 6 s. 3 d. $\frac{1}{7}$, ſo much

must bee paid for the said piece of Arras.

If I buy a piece of Arras, containing 15 $\frac{1}{7}$ elles in length, Flemish measure, and in bredth 2 $\frac{1}{7}$ elles English measure: I demaund how many square elles Flemish, or English the same piece containeth? Answere: first, see how many elles Flemish is in 2 $\frac{1}{7}$ elles English, and you will finde 3 $\frac{2}{3}$, so that now your length is 15 $\frac{1}{3}$, and your bredth 3 $\frac{2}{3}$, all Flemish measure; therefore to know how many square elles is contained in that length and bredth, multiplie the one by the other, and you will finde 57 $\frac{7}{24}$ square elles Flemish measure. Likewise to know how many square elles English the said length and bredth containeth, reduce 15 $\frac{1}{3}$ elles Flemish into English elles, and you will haue 9 $\frac{1}{5}$ in length, and 2 $\frac{1}{7}$ in bredth all English measure; therefore multiplie the length by the bredth, and you will finde 20 $\frac{1}{8}$ square elles English measure: so the Answere to the question is, that the said length and bredth containeth 57 $\frac{7}{24}$ square elles Flemish, and 20 $\frac{1}{8}$ square elles English. And thus must you worke for the solution of any question in this nature: for the proofe of this, or such like, you know that 5 elles Flemish is but three elles English.; therefore put 5 into his square, multiplying 5 by 5, maketh 25 Flemish: likewise 3 by 3, maketh 9 English; then say by the Rule of 3, If 25 giue but 9, what shal 57 $\frac{7}{24}$? multiplie and diuide, so haue you 20 $\frac{1}{8}$. Againe, If 9 giue 25, what shall 20 $\frac{1}{8}$? worke, and find 57 $\frac{7}{24}$, so that euery way you perceiue it to be truly resolued.

At 4 s. 8 d. the elle Flemish, what shall I pay for 7 $\frac{2}{3}$ elles English? you know by the former reasons, that an elle Flemish is but $\frac{4}{5}$ of an elle English, therefore say by the Rule of 3, If $\frac{3}{5}$ cost 4 s. 8 d. what shall 7 $\frac{2}{3}$ cost? put your whole numbers into their broken, place them orderly in your Table, multiplie and diuide, and you shall finde 2 li. 19 s. 7 d. $\frac{1}{3}$, so much must the 7 $\frac{2}{3}$ elles English cost at 4 s. 8 d. the Flemish elle.

If 1 square elle Flemish cost 6 s. 8 d. what shall I pay for 6 $\frac{1}{3}$ square elles English, we haue shewne you before, that an elle square Flemish, is in proportion to an elle square English, as 9 to 25; therefore say by the Rule of 3, If $\frac{9}{25}$ cost $\frac{1}{3}$ pound, what shall 6 $\frac{1}{3}$ cost? worke, and you shall finde 6 li. 2 s. 2 d. $\frac{2}{3}$, so much must be paid for 6 $\frac{1}{3}$ square elles English.

Questions

Queſtions of Loane and Intereſt.

A Friend hath lent me 239 li. for 7 ½ moneths freely without Intereſt, and afterwards borroweth of me 140 li., the queſtion is, how long he may vſe my money, to requite his former curteſie? Anſwer: ſay by the Reuerſe or Backer Rule of 3, If 239 li. require 7 ½ moneths, what time ſhall 140 li. require? multiplie and diuide, and you ſhall finde 12 $\frac{45}{76}$ moneths, ſo long time may my friend vſe my money to make the curteſie equall.

I lent my friend 140 li. for 12 $\frac{45}{76}$ moneths, I demaund how much money he ought to lend me for 7 ½ moneths, to requite my courteſie? Anſwere: Say by the Backer Rule of 3, If 12 $\frac{45}{76}$ moneths require 140 li., what ſhall 7 ½ moneths require? multiplie and diuide, and you ſhall finde 239 li. for the proofe of both queſtions.

A Merchant hath taken vp 655 li. at Intereſt for 5 moneths, after the rate of 8 li. in the 100 li. for 12 moneths, the queſtion is, what the Intereſt commeth to? Anſwere by the Double Rule of 3, If 100 li. giue 8 li. what ſhall 655 li. giue? multiplie and diuide, ſo haue you 52 $\frac{2}{5}$ li.: then ſay againe, If 12 moneths giue 52 $\frac{2}{5}$ li., what ſhall 5 moneths giue? worke, and you haue 21 $\frac{1}{6}$ li. for the anſwere of the queſtion.

But if you will worke it at one working, ſay by the Rule of 3 Compoſed: If 100 li. in 12 moneths gaine 8 li., what ſhall 655 li. gaine in 5 moneths? multiplie the firſt number by the ſecond for your diuiſor, and you haue 1200; then multiplie the other three numbers one into the other, and you haue 26200 for your diuidend; diuide 26200 by 1200, the quotient giues you 21 $\frac{1}{6}$ li. as before.

A Merchant hath payed 21 $\frac{1}{6}$ li. for 5 moneths Intereſt of moneyes deliuered him, after the rate of 8 li. in the 100 li. for 12 moneths; I demaund what the Principall ſhould be? Anſwer by the double Rule of 3, If 5 moneths gaine 21 $\frac{1}{6}$ pounds, what ſhall 12 moneths gaine? multiplie and diuide, ſo haue you 52 $\frac{2}{5}$ li.: then ſay againe, If 8 li. be come of 100 li., of what

ſhall

shall come 52 $\frac{3}{5}$ li. worke by the Rule of 3 Direct, and you haue 655 li. your define.

Or thus, If 8 li. be come of 100 li. of what shal come 21 $\frac{5}{8}$ li.? worke, and you haue 272 $\frac{11}{12}$ li. Againe, If 5 moneths giue 272 $\frac{11}{12}$ li. what shall 12 moneths giue? put your whole number into his broken, and you haue $\frac{3275}{12}$, by the denominator of which being 12, you are to multiplie your 5 moneths for your diuisor: then are you to multiply the numerator by 12 also for your diuidend; therefore seeing that 12 is a multiplier, both to your diuisor, and also to your diuidend, omit both those multiplications, and onely diuide 3275 by 5, the quotient giues you 655 li. as before.

But if you will worke it by the Rule of 3 Composed, you must propound it thus, If 100 li. in 12 moneths doe gaine 8 li., what money in 5 moneths shall gaine 21 $\frac{5}{8}$ li.? make all your numbers fractions, so haue you $\frac{100}{1}, \frac{12}{1}, \frac{8}{1}, \frac{5}{1}, \frac{21\frac{5}{8}}{1}$; then multiplie the third number by the fourth, and againe by the denominator of the fifth, so haue you 240 for your diuisor. Againe, multiplie the first number by the second, and againe by the numerator of the fifth, so haue you 157200 for you diuidend; which diuided by 240, giueth 655 li. agreeable to both the other workings: and thus by the Backer Rule composed, may you worke any question of this nature.

A Merchant hath payed 119 li. 14 s. for the Interest of 1680 li., which he vsed 9 $\frac{1}{2}$ moneths, the question is, what hee payeth in the 100 li. for 12 moneths? Answer by the first part of the Rule Composed, If 1680 li. in 9 $\frac{1}{2}$ moneths doe gaine 119 li. 14 s., what doth 100 li. gaine in 12 moneths? put all your numbers into fractions, and they stand in the Table, thus: then multiplie the first number by the second, it produceth $\frac{1680}{19}$ for your diuisor. Likewise multiplie the other three numbers one into another, and they make $\frac{1680000}{19}$ for your Diuidend. Finally, diuide your diuidend by your diuisor,

x.	m.	c.	x.	li.	s.	d.
	1	6	8	0		1
			1	9		2
1	1	1	9	7	1	0
		1	0	0		1
			1	2		1

diuiſor, and the quotient brings forth 9 li. for the Intereſt of 100 li. for 12 moneths.

A Merchant hath borrowed 1680 li. after the rate of 9 li. in the 100 li. for 12 moneths: the queſtion is, what time he ſhall vſe the money, to returne it with 119 li. 14 s. profit? Anſwere by the Double Rule of 3 Direct, If 100 li. gaine 9 li., what ſhall 1680 li. gaine? worke, and you haue $151\frac{1}{5}$ li.: then ſay againe, If $151\frac{1}{5}$ li. require 12 moneths, how many moneths ſhall $119\frac{7}{10}$ li. require? multiplie and diuide, ſo haue you $9\frac{1}{2}$ moneths for the anſwere of your queſtion.

Or thus, by the Backer Rule of 3 Compoſed, If 100 li. in 12 moneths doe gaine 9 li. in how many moneths ſhall 1680 li. gaine $119\frac{7}{10}$ li.? multiplie the third and fourth numbers together, ſo haue you 15120 for your diuiſor; then multiplie the firſt, ſecond, and fifth together, ſo haue you $143640\frac{0}{10}$ for your diuidend; ſo diuiding, the quotient giues you $9\frac{1}{2}$ moneths, as before.

A Merchant deliuereth money at Intereſt for 9 li. in the 100 li., and at the yeeres end he receiueth 1865 li. both for Principall and Intereſt, the queſtion is, what money hee deliuered? Anſwere: Say by the Rule of 3 Direct, If 109 li. giue but 100 li., what ſhall 1865 li. giue? worke, and finde $1711\frac{1}{109}$ li. ſo much money was deliuered.

A Merchant hath taken vp 320 li. for 3 yeeres and 7 moneths, at the end of which time, he muſt pay 436 li. for all, both principall and gaine; the queſtion is, what he payeth in the 100 li. for 12 moneths? Anſwere: Firſt, put your 3 yeeres 7 moneths all into moneths, ſo haue you 43 moneths; then ſubtract 320 li. the principal from 436 li., remaineth 116 for the Intereſt. This done, ſay by the firſt part of the Rule of 3 Compoſed, If 320 li. in 43 moneths doe gaine 116 li., what ſhall 100 li. gaine in 12 moneths; 320 li. 43 mo. 116 li. 100 li. 12 mo.? multiplie the firſt by the ſecond for your diuiſor, and the other 3 one into another for your diuidend, and the quotient giues you $10\frac{1}{43}$ li. ſo much he payeth in the 100 pound for twelue moneths.

A Merchant is indebted 800 li., to be paide in 8 yeeres by 100 li. yeerely, and he agreeth with his Creditor to abate him

11 li. in the 100 li. and take present paiment; the question is, what readie money he ought to pay him without Interest vpon Interest? Answere: First, see by the Rules of paiment, at what time the money ought to be paid together, and you will finde at $4\frac{1}{2}$ yeeres: that $4\frac{1}{2}$ multiplie by 11 (the Interest of 100 li.) so haue you 49½ li. for the vse of 100 li.; therefore say by the Rule of 3 Direct, If 149½ li. giue but 100 li. what shall 800 li. giue? multiplie and diuide, and you shall finde $535\frac{85}{299}$ li. which fraction is worth 2 s. 4 d. $\frac{28}{299}$ of a penny, so much must he pay him for his 800 li. abating 11 li. in the 100 li. for Interest.

A Merchant is indebted 676 li. whereof he is to pay 169 li. at 8 moneths, 169 li. 2 yeere after the first paiment, 169 li. one yeere after the second paiment, and 169 li. at the ende of 5 yeeres from the beginning. Now they haue agreed to abate 12 li. in the 100 li. for Interest, and pay this 676 li. present paiment, the question is, what money must be paied, without reckoning Interest vpon Interest? Answere: First, seeke at what time the whole debt should bee paied together, and you will finde at 38 moneths; then 12 li. for 12 moneths, is 38 li. for 38 moneths; therefore, say by the Rule of 3, If 138 li. giue but 100 li. what shall 676 li. giue? worke, and you shall finde 489 li. 17 s. 1 d. $\frac{5}{23}$, so much must the said Merchant pay in readie money.

A Merchant oweth 2700 li. whereof hee is to pay 100 li. the first yeere, 200 li. the second yeere, 600 li. the third yeere, and 1800 li. the fourth yeere, and he doth agree with his Creditor to make present paiment, abating 9 li. in the 100 li. simple Interest, the question is, what money must bee paid him for his 2700 li.? Answere: first (as in all questions of this nature) seeke the iust time of paiment by multiplying, as you are taught in the Rules of paiment, each particular paiment by his owne time, and the adding the products together; so haue you $3\frac{14}{27}$ yeeres, for the iust time of paiment; this done, consider that 9 li. is the interest of 100 li. for one yeere, therefore multiplie the said $3\frac{14}{27}$ by 9, so haue you $31\frac{2}{3}$ li. for the Interest of 100 li. for $3\frac{14}{27}$ yeeres; then say by the Rule of 3 Direct, if $131\frac{2}{3}$ li. giue but 100 li. what giueth 2700 li.? multiply & diuide, the quotient

tient brings forth 2050 li. 12 s. 7 d. $\frac{21}{33}$ of a penny, ſo much money muſt be paid for the 2700 li. abating 9 li. in the 100 li. for Intereſt.

A Noble man is indebted 36000 li. to be paid 18000 li. at two yeeres, 9000 li. at 4 yeeres, and 9000 li. at 6 yeeres; which debt he compoundeth for 27000 li. preſent payment: I demaund what Intereſt was allowed him in the 100 li. for 12 moneths by this compoſition? Anſwere: firſt, finde the iuſt time of payment, and you haue 3 $\frac{1}{2}$ yeeres: that done, take 27000 li. from 36000 li. and there remaineth 9000 li. gained by the preſent paiment. Now ſeeing that you haue three Cyphers following each number, omit all your Cyphers, and ſay by the firſt part of the Rule of 3 Compoſed, If 7 li. in 3 $\frac{1}{2}$ yeeres doe gaine 9 li., what ſhall 100 li. gaine in one yeere? multiplie and diuide, and you ſhall finde 9 li. 10 s. 5 d. $\frac{5}{7}$, ſo much was allowed in the 100 li. for 12 moneths to haue preſent payment.

Intereſt vpon Intereſt.

A Merchant hath deliuered 350 li. at Intereſt for 3 yeeres, after the rate of 10 li. in the 100 li., and euery yeere Intereſt vpon Intereſt: the queſtion is, what money muſt bee paid him at the 3 yeeres ende for his 350 li.? Anſwere: This queſtion may bee wrought by the Rule of 3 Direct, at 3 ſeuerall workings, in ſaying, If 10 giue 11, what ſhall 350 giue? worke and you haue 385 li. for the firſt yeere. Againe, if 10 giue 11, what ſhall 385 giue? worke, and finde 423 $\frac{1}{2}$ li. for the ſecond yeere. Yet againe, If 10 giue 11, what ſhall 423 $\frac{1}{2}$ giue? multiplie and diuide, and you haue 465 li. 17 s. ſo much muſt bee paid him at the ende of 3 yeeres for his 350 li. after the rate of 10 li. in the 100 li., and euery yeere Intereſt vpon Intereſt.

But to worke this, or any queſtion of this nature, our Table doth afford a methode more briefe, more eaſie, and moſt certaine, by placing our firſt number in the firſt row, and in a high place, as in this example following; where you ſee we haue placed our 350 li. as if it were 350 millions: but we reſpect not the denomination of the place, onely allowing the firſt, as the

place of hundreds, and leauing at the other places beneath it, that we may worke downeward, as our queſtion importeth.	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
		3	5	0						8	5	
			3	5								
		3	8	5								
			3	8	5				1	0	0	
		4	2	3	5							
			4	2	3	5				1	7	
		4	6	5	8	5						
				1	0	0				2	0	

Thus hauing ſet our ſumme 350 in the firſt row, in the ſecond row we take his $\frac{1}{10}$, 35, as you ſee in the example; this 35 we adde into the 350 in the firſt row, and it maketh 385: that done, wee againe take the $\frac{1}{10}$ of 385, which is 38, and 5 a place lower, as in the example, wee adde this into the former, and it maketh 423 and 5 beneath it. Againe, wee take the $\frac{1}{10}$ of 423, and alſo of the 5 beneath it, ſo haue we 42, and 35 beneath, as you ſee in the example, all which we adde into the former, and it maketh 465 li. and 85 beneath, to which 85 we ſet a denominator a place higher, ſo haue we $\frac{85}{100}$; or wee take the ſame $\frac{85}{100}$, and carrie it downe to the place of Vnities, as you may perceiue in the example, and there either abbreuiate it into $\frac{17}{20}$ of a pound, or worke it into ſhillings and peace, as occaſion ſerueth, euery way the anſwere is 465 li. 17 s., as before.

A Merchant hath taken vp 400 li. at Intereſt for 3 yeeres, after the rate of 9 li. in the 100 li., and euery yeere Intereſt vpon Intereſt, the queſtion is, what money muſt be returned at 3 yeeres ende? Anſwere: Place your 400 li. in the firſt row of your Table, as in the example following: then point 2 places lower, and there reckon 9 times 4 is 36, adde that into the 400 li., ſo haue you 436 li. for the firſt yeere. Againe, point 2 places lower from each figure, and multiplie them all by 9, ſo haue you 39..24, as in the example, adde that into the former, it maketh 475..24 for the ſecond yeere. Yet againe, point 2 places beneath each figure, and multiplie them all by 9, ſo you haue

haue	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
42..7716		4	0	0			0	1	1	6		
for the			3	6		1	0	0	0	0		
third yere,		4	3	6								
as in the			3	9	2	4						
third		4	7	5	2	4						
worke of			4	2	7	7	1	6				
the exam-		5	1	8	0	1	1	6				
ple; this ad-												
ded into												
the princi-												
pall, ma-												
keth												

518 li. .01 16 for the third yeere, which 01 16 carried lower, and made a fraction, ſtandeth $\frac{116}{10000}$, as the example manifeſteth, & being abbreuiated, is $\frac{29}{2500}$ of a pound; or being wrought into his true value, is two pence $\frac{24}{125}$ of a penny: ſo the anſwere is, that 400 li. principall, deliuered at Intereſt vpon Intereſt for 3 yeeres, at 9 li. in the 100 li. amounteth to 518 li. 0 s. 2 d. $\frac{24}{125}$.

A Merchant hath receiued 200 li. at Intereſt for 3 yeeres, after the rate of 12 li. in the 100 li. and euery yeere Intereſt vpon Intereſt, the queſtion is, what money muſt bee paid at the 3 yeeres ende, for 200 li. ſo receiued? Anſwere: ſet your 200 li. in the firſt row of your Table, thus: then in the ſecond row ſet 2 a place lower, ſo haue you taken 10 in the 100; in the third place, double 2 maketh 4; ſo haue you taken 12 in the 100 for the firſt yeere, being 24 li., as you ſee in the example.

	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
		2	0	0			9	8	5	6		
			2	4		1	0	0	0	0		
		2	2	4								
			2	6	8	8						
		2	5	0	8	8						
			3	0	1	0	5	6				
		2	8	0	9	8	5	6				

this added to the principall, maketh 224 li.; then wee take the Intereſt of 224 li., ſetting 2 in the ſecond place, and twice 2 in the third place of our firſt figure; likewiſe for our ſecond figure 2, we ſet once 2 in his ſecond place, and twice 2 in his third place; alſo for our laſt figure 4, we ſet once 4 in his ſecond place, and 2 times 4 in his third place, ſo haue we 250..88, as in the ſecond worke of the example; with which 250..88 proceeding, according to this inſtruction, you wil find 280 li... $\frac{9816}{10000}$, as in the third worke of the example; which fraction abbreuiated, is $\frac{616}{625}$ of a pound, and wrought into the true value, giueth 19 s. 8 d. $\frac{68}{125}$; whereby appeareth, that 200 li. in three yeeres, at 12 li. in the 100 li., Intereſt vpon Intereſt, yeeldeth 280 li. 19 s. 8 d. $\frac{68}{125}$, which is the anſwere of the queſtion. And thus by one of theſe three examples may you worke for any queſtion of this nature, whatſoeuer the money, time, or Intereſt be.

A Merchant is indebted 900 li. to be paid in three yeeres, euery yeere 300 li., and hee doth agree with his Creditor, to pay him altogether at the three yeeres end, allowing 8 li. in the 100 li. for Intereſt, and euery yeere Intereſt vpon Intereſt: the queſtion is, what money muſt be paid at the 3 yeeres end? Anſwere. In this and ſuch like queſtions, you muſt conſider, that one yeere muſt paſſe, before any money is due; therefore for the firſt yeere ſet 300 li. in the firſt row of your Table, as in this example; then for the ſecond yeere you muſt pay 300 li., and the Intereſt of the firſt 300 li., that is, 324 li., as in the ſecond worke of the example. Againe for the third yeere, you

	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
		3	0	0					9	2		
								1	0	0		
		3	2	4								
		6	2	4								
		3	4	9	9	2						
		9	7	3	9	2						

you muſt pay 300 li, and the Intereſt of all that is paſt, both Principall and Intereſt, which is 349 li. .. 92 beneath, as in the third worke of the example; theſe added together, maketh 973 li., and $\frac{92}{100}$ of a pound, which reduced, giueth 18 s. 4 d. $\frac{4}{5}$, ſo the anſwere is, that the ſaid Merchant muſt pay at the ende of three yeeres, 973 li. 18 s. 4 d. $\frac{4}{5}$, which was the queſtion demaunded.

Or, if you pleaſe, you may worke it thus, finde the iuſt time when the whole 900 li. is to bee paid together, and you ſhall finde at 2 yeeres; but our debtor hath 3 yeeres allowed him, that is one yeere more then his time, for which time he is to pay the Intereſt of his whole debt, & alſo the Intereſt of the Intereſt for the ſecond yeere, that is, of 24 li.; therefore ſet 924 li. and 900 li. in the firſt and ſecond rowe of your Table, thus; then to the ſecond take the Intereſt of the firſt, and you ſhall haue 973 li. .. $\frac{92}{100}$ as before, which is the proofe of both queſtions.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
	9	2	4				9	2			
						1	0	0			
	9	7	3	9	2						

A Merchant is to pay 2355 li. at the ende of 4 yeeres, and hee agreeth with his Creditor to make preſent paiment, abating 10 li. in the 100 li. Intereſt vpon Intereſt: I demaund what money he muſt tender for the preſent payment of this debt? Anſwere: ſet a vnitie in any high place of your Table, as in this example following, where you ſee, wee haue ſet our vnitie, in the place of ten thouſands: then we take the Intereſt vpon Intereſt of the ſaid vnitie for 4 yeeres, as wee haue taught you before, ſo haue we 1464 li. as you ſee in the example: this done,

done, we ſay by the Rule of 3 Direct, If 14641 giue but 10000, what ſhall 2355 li. giue? multiplie and diuide, the quotient

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
					1						
						1					
						1	1				
						1	2	1			
						1	3	3	1		
					1	4	6	4	1		
					1	0	0	0	0		
						2	3	5	5		

brings forth 1608 li., and $\frac{7273}{14641}$ of a pound, which in his knowne value is 1608 li. 9 s. 11 d. $\frac{3001}{14641}$, ſo much muſt the ſaid Merchant pay in ready money.

A Merchant hath owing him 2648 li. to be paid at the end of 3 yeeres: but hauing daily vſe for money, hee agreeth with his debtor, to pay him euery yeere $\frac{1}{3}$ part, and he to allow him 10 li. in the 100 li., euery yeere Intereſt vpon Intereſt: the queſtion is, how much he muſt pay at euery payment, after this abatement? Anſwere: ſet a Vnitie in the place of hundreds in your Table, thus: and allow it as 100 li.: then adde to it

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
							1	1	0		
							1	0	0		
							2	1	0		
								2	1		
							2	3	1		
							1	0	0		
							3	3	1		
							1	0	0		
						2	6	4	8		

10 li. for Intereſt, ſo haue you 110 li. for the firſt yeere; to which 110 li. adde another 100 li. ſo haue you 210 li., take the Intereſt of this, which is 21, and adde into it, ſo haue you 231 li. for the ſecond yeere; now at the third yeere the money

is

is due, and requires no Intereſt, therefore adde into the former, onely 100 li. principall, ſo haue you 331 li. raiſed by this meanes out of 100 li.; and the very ſame proportion that this had in riſing, muſt the whole debt haue in falling; therefore ſay by the Rule of 3 direct, If 331 li. giue but 100 li., what ſhall 2648 li. giue? multiplie and diuide, and the quotient giues you 800 li., ſo much is to bee paied euery yeere of the 3, vpon the agreements aforeſaid.

A Merchant is to pay 1200 li. in 4 yeeres by equall portions, that is to ſay, euery yeere 300 li., and he agreeth with his Creditor to pay him altogether in ready money, abating 10 li. in the 100 li. for Intereſt, and euery yeere Intereſt vpon Intereſt; the queſtion is, how much hee muſt pay in ready money?

Anſwere. This and ſuch like queſtions require a twofold working, becauſe you muſt firſt finde what the ſaid principall will be at the end of 4 yeeres, by ſetting 300 li. for the firſt yeere, 300 li. and the Intereſt of the former for the ſecond yeere, and ſo proceeding, as in this example, and as we haue taught you in a queſtion of this nature aforegoing, all which amounteth to 1392 $\frac{1}{10}$ li., ſo much were to be paid at the end of 4 yeres. Now to finde what muſt be paid preſent, the ſecond queſtion before going, ſhewes you how to ſet a vnitie in one place of your Table, and take the Intereſt of it for 4 yeeres, where you may ſee, it amounteth to 14641; therefore (as in the ſame worke) ſay by the Rule of 3 Direct, If 14641 giue but 10000, what ſhall 1392 . $\frac{1}{10}$ giue? multiplie and diuide, and you ſhall finde 950 li., and $\frac{14010}{14641}$ of a pound, which in his knowne value is 950 li.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
		3	0	0							
		3	3	0		1	4	6	4	1	
		3	6	3		1	0	0	0	0	
		3	9	9	3		1	3	9	2	$\frac{1}{10}$
	1	3	9	2	3						

19 s. 2 d. $\frac{3370}{14647}$ parts of a penny, ſo much muſt the ſaid Merchant pay in ready money.

A Merchant doth owe 1500 li. to bee paid in 5 yeeres by 300 li. yeerely, and he doth agree with his Creditor to pay him all in three yeeres, to wit, euery yeere $\frac{1}{3}$ part, each allowing the other, 10 li. in the 100 li. for Intereſt, and euery yeere Intereſt vpon Intereſt; I demaund what the yeerely paiment ought to be, that one may be as much as the other? Anſwere. This queſtion doth require a threefold working, becauſe you muſt allow the one 10 li. in the 100 li. and abate the other 10 li. in the 100 li., and afterwards adde the increaſe of the one, and the remaines of the other into one totall for your number to work vpon;

	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
therefore		3	0	0				3	0	0		
to worke		3	3	0				3	3	0		
it orderly, you muſt		3	6	3				6	3	0		
conſider		9	9	3								
that one									1	1		
yeere muſt									1	0		
paſſe be-								3	0	0		
fore any								2	7	2	$\frac{8}{11}$	
money is								3				
due; there-									1	1		
fore for									1	0		
the firſt								5	7	2	$\frac{8}{11}$	
yeere, ſet 300 li. in												

your Table, as in this example: then for the ſecond yeere, ſet other 300 li., and the Intereſt of the firſt that is 330 li., as in the ſecond worke of the example: then for the third yeere, ſet other 300 li., and the Intereſt of all that is paſt, ſo haue you 363 li., as in the third worke of the example, theſe three added together, make 993 li. with the increaſe of the debtor. Now for your Creditor, he is to abate 10 li. in the 100 li. for the other two yeeres, therefore for the firſt yeere, ſay by the Rule of 3, If 11 giue but 10, what ſhall 300 giue? worke, and you haue 272 $\frac{8}{11}$. To this againe adde your other 300 li. for the

ſecond

ſecond yeere, all maketh 572 $\frac{8}{11}$; then ſay againe, If 11 giue but 10, what ſhall 572 $\frac{8}{11}$ giue? worke and finde 520 $\frac{80}{121}$ li. with the Creditors abatement: this done, adde both your prepared numbers together, 993 li. and 520 $\frac{80}{121}$ li., ſo haue you 1513 $\frac{80}{121}$ li., ſo much were to bee payed at 3 yeeres by this agreement: but for that it is to be paied yeerely by euen portions, you muſt therefore take 100 for one yeere, 110 for the ſecond yeere, and 121 for the third yeere, which is euen portions, and Intereſt vpon Intereſt, as your payments ought to be, and being added together, maketh 331 for the firſt number, in the Rule of 3; therefore to conclude ſay, If 331 giue but 100, what ſhall 1513 $\frac{80}{121}$ giue? multiplie and diuide, and the quotient brings forth 457 li. 5 s. 11 d. $\frac{3481}{4051}$, of a penny, ſo much muſt the ſaid Merchant pay, euery yeere of the 3, in diſcharge of 1500 li., according to the agreements aforeſaid.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
	9	9	3	$\frac{80}{121}$				1	1		1
	5	2	0					1	0		1
1	5	1	3			6	3	0	0	1	1
							5	2	0	$\frac{80}{121}$	
							3	3	1		
							1	0	0		
						1	5	1	3	$\frac{80}{121}$	

A noble man oweth 10000 li. to bee paied at this preſent, but he agreeth with his Creditor to pay him euery two yeeres 4000 li., vntill all be paid, allowing 10 li. in the 100 li. for Intereſt, and euery yeere Intereſt vpon Intereſt; I demand, in what time all the 10000 li. ſhal bee paied, and what the laſt paiment ſhall bee? Anſwere. Set your vnitie in the higheſt place of your Table, as in this example following, and take the Intereſt vpon Intereſt for two yeeres, ſo haue you 12100 li., from which ſubtract 4000 li. for the firſt paiment, remaineth 8100 li. of which againe take two yeeres Intereſt vpon Intereſt, and adde into the principall, al maketh 9801 li. from which ſubtract 4000 li. for the ſecond paiment, remaineth 5801 li.;

take the	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
Intereſt	1	0	0	0	0							
of this,		1	0	0	0							
and ad		1	1	0	0							
into it,	1	2	1	0	0							
all ma- 1		4	0	0	0							
keth		8	1	0	0							
7019|-			8	1	0							
21, ſub-			8	9	1							
tract		9	8	0	1							
4000 li.		4	0	0	0							
for the 2		5	8	0	1							
third			5	8	0	1						
paiment,			6	3	8	1	1					
remai-		7	0	1	9	2	1					
neth	3	4	0	0	0							
3019|-		3	0	1	9	2	1					
21; of			3	0	1	9	2	1				
this a-			3	3	2	1	1	3	1			
gaine,	4	3	6	5	3	2	4	4	1			
take the												
Intereſt												
for two												
yeeres,												
and ad												
into the												
princi-												

pall, it maketh 3653|2441: now of thoſe figures cut off with the line, make a fraction, by ſetting a vnitie a place higher as a denominator, ſo haue you $3653\frac{2441}{10000}$ li., which for that it wanteth of 4000 li., is the laſt paiment, and manifeſteth, that in 8 yeeres, the whole debt ſhall be diſcharged.

The

The Rule of Alligation.

THe Rule of Alligation ſerueth to alligate, bind, or mixe together ſundrie parcels of different prices, fineneſſe, or goodnes; and in the ſame Alligation, or mixture, to know how much you ſhall take of euery parcell; or after the ſaid mixture to know the common price, fineneſſe, or goodnes, according to the numbers, values, or proportions that you worke vpon, of which we will giue you ſundrie examples appropriated to the methode, or working of our Table:

A Brewer would mixe 16 buſhels of Barley-Malt at 3 s. 2 d. the buſhell, with 30 buſhell of Oaten-Malt at 21 d. the buſhel, and 2 buſhell of wheate-meale at 4 s. 8 d. the buſhell; theſe 3 being mixed together, the queſtion is, what the buſhell ſhall be worth of the ſaid mixture? Anſwere. In this and ſuch like queſtions, you muſt multiplie each parcell by his value, and then adde all the products together for your diuidend; then adde all the parcels together for your diuiſor, ſo diuiding, the quotient is the anſwere of the queſtion, as in this example: 3 s. 2 d. is 38 pence, therefore multiplie 16 by 38, and you haue 608 pence in the firſt row of your Table for your 16 buſhells of Barley-Malt; then in the ſecond row multiplie 30 by 21, ſo haue you 630 pence for the 30 buſhels of Oaten-Malt. Again, multiplie in the third row 56 (the pence in 4 s. 8 d.) by 2, the buſhels of Wheate-meale, ſo haue you 112; theſe 3, 608 630, and 112, adde into the ſecond row of your Table, and they make 1350 pence for your diuidend; likewiſe adde 16, 30, and 2, the particulers of your graine together, and they make 48 for your diuiſor. Finally, diuide 1350 by 48, and the quotient giues you 28 $\frac{1}{4}$ pence, ſo much ſhall the buſhell be worth of that mixture; and thus muſt you doe with any mixture whatſoeuer of this nature: but if you will mixe equall portions of vnequall prices, you muſt onely adde their prices together, and take the $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, or ſuch part as the number mixed: as if you would mixe large Cloues of 5 s. 6 d. the li., with middle Cloues of 2 s. 8 d. the li., you muſt adde 5 s. 6 d., and 2 s. 8 d. together, maketh 8 s. 2 d., of which the $\frac{1}{2}$, 4 s. 1 d., is the price

of the pound ſo mixed: but if you would haue a like portion of fuſt, at 22 d. the li., then muſt you ad 5 s. 6 d., 2 s. 8 d. and 22 d. together, all maketh 10 s.; of which, becauſe you haue 3 particulars, you muſt take the $\frac{1}{3}$, 3 s. 4 d. for your value: and ſo of all other in this nature.

Againe, if you would mixe $\frac{1}{2}$ of large Cloues, $\frac{2}{5}$ of middle, and $\frac{3}{7}$ of fuſt, you muſt take ſome number that hath all theſe parts, which if you cannot readily finde, multiplie all the denominators together, ſo haue you 70, of which $\frac{1}{2}$ is 35; $\frac{2}{5}$ is 28, and $\frac{3}{7}$ is 30, then 35 li. at 5 s. 6 d. the li., maketh 9 li. 12 s. 6 d. and 28 li. at 2 s. 8 d. the pound, giueth 3 li. 14 s. 8 d.; likewiſe 30 li. at 22 d. the pound, giueth 2 li. 15 s. 0 d.; theſe 3 added together, maketh 16 li. 2 s. 2 d. for your diuidend. Likewiſe adde your 3 parcels together, 35, 28, and 30. ſo haue you 93 for your diuiſor: ſo diuiding 16 li. 2 s. 2 d. by 93, the quotient giues your 3 s. 5 d. $\frac{53}{81}$ of a penny for the li waight of ſuch a mixture.

Now if you would haue 112 li. waight of ſuch a mixture, you muſt worke as in Fellowſhip, ſaying, If 93 giue 35, what ſhall 112 giue, and ſo proceeding with 28, and with 30, by which worke you ſhall finde 42 $\frac{14}{93}$ li. waight large Cloues, 33 li. $\frac{67}{93}$ of middle, 36 $\frac{12}{31}$ of fuſt. And thus muſt you worke, whether you take a greater, a leſſer, or any quantitie whatſoeuer.

A Gold-ſmith hath three ſorts of ſiluer Bullion, that is to ſay, 3 li. 5 ounces of 8 ounces fine, 5 li. $\frac{1}{3}$ of 6 ounces fine, and 9 li. 4 ounces, at 4 ounces and 6 penny waight fine; theſe three being melted together, the queſtion is, of what fineneſſe the li. waight of that mixture ſhall bee? Anſwere. Multiplie euery Bullion by his owne fineneſſe, firſt, 3 li. 5 ounces by 8 ounces, maketh 27 $\frac{1}{2}$; then 5 li. $\frac{1}{3}$ by 6 ounces, maketh 33; and laſtly, 9 li. 4 ounces by 4 ounces 6 penny waight, maketh 40 $\frac{2}{17}$ ounces fine: this done, adde your three products together, 27 $\frac{1}{2}$, 33, 40 $\frac{2}{17}$, and they make 100 $\frac{7}{17}$: likewiſe adde all your Bullions together, that is 3 li. 5 ounces (or $\frac{1}{3}$) 5 li. $\frac{1}{3}$, and 9 li. $\frac{4}{12}$, and they make 18 $\frac{1}{4}$ for your diuiſor: finally, diuide 100 $\frac{7}{17}$ by 18 $\frac{1}{4}$, and the quotient giues you 5 $\frac{153}{1809}$ ounces fine, which fraction is worth 10 penny waight, 2 graines, $\frac{39}{53}$ of a graine; and of this

fineneſſe

fineneſſe ſhall the pound waight of the ſaid Bullions bee after the ſaid mixture.

But if the ſaid Gold-ſmith would haue put a quantitie of copper into the ſaid mixture, you muſt then haue added that quantitie into the totall of your Bullions, and ſo haue made your diuiſor of all together; as if hee had put in 3 li. of copper, you muſt haue added 3 to $18\frac{1}{2}$, ſo your diuiſor had been $21\frac{1}{2}$, by which diuiding $100\frac{7}{11}$, the quotient would bee $4\frac{92}{127}$ fine, that is 4 ounces, 14 penny waight, 13 graines, and $\frac{11}{127}$ of a graine: of ſo many ounces fine would the ſaid mixture haue been, if he had put 3 li. of Copper into the mixture.

But now hauing ſhewed you an example of metteſt-mixing, it is requiſit that you know the waights appertaining to Gold and ſiluer, of which the pound Troy waight is generally vſed in Siluer, wherein there is contained 12 ounces, euery ounce containeth 20 penny waights, and euery penny waight 24 graines; & thoſe graines into 20 ſmaller parts at your pleaſure.

Of Gold, one ounce of the fineſt, without any aloy, is taken to be 24 karrats; one karrat is diuided into 4 graines, 1 graine into 2 halfes, 4 quarters, and ſmaller parts, as occaſion ſerueth.

A Gold-ſmith hath melted 3 li. waight of Gold of 23 karrats fine, with 6 li. waight of 19 karrats, & with $14\frac{1}{2}$ li. waight of 16 karrats fine. Now I demaund, of what fineneſſe the li. waight ſhall be of this mixture? Anſwere. Multiply, as in the former example, euery waight by his fineneſſe, that is 3 by 23, giueth 69; then 6 by 19, maketh 114; likewiſe $14\frac{1}{2}$ by 16, giueth 232, which workes you may accompliſh in 3 rowes of your Table, and the products ſtand ready for your addition; then adde them together, and there is 415: likewiſe adde your Bullions together 3, 6, and $14\frac{1}{2}$, ſo haue you $23\frac{1}{2}$ for your diuiſor, then diuide 415 by $23\frac{1}{2}$, and the quotient giues you $17\frac{31}{47}$; of ſo many karrats fine, ſhall be the li. waight of the ſaid mixture.

A Gold-ſmith hath 4 ſorts of Gold at ſeuerall values, that is, of 43 ſhillings the ounce, of 48 ſhillings, of 54 ſhillings, and of 59 ſhillings the ounce; by mixing of which 4 ſorts, he would make a Goblet of 24 ounces waight, which ſhould ſtand him

in

In iuſt 50 ſhillings the ounce, I demaund how much hee muſt take of euery ſort? Anſwere. To worke this or the like queſtion by your Table, you muſt vſe all the places of vnities, for the placing your numbers, your differences, and the working your queſtion; as vnities of Millions, vnities of thouſands, and proper vnities, without reſpecting the denominations of the places, otherwiſe then if they were of ſingle denomination: this obſerued, you ſhall place your 4 numbers, of which you make your mixture, that is 43, 48, 54, 59, in foure rowes of your Table at the firſt place, as you ſee in this example: Then the generall value, into which you will reduce them, which now is 50 ſhillings, you ſhall ſet in the ſecond or third row of your Table, 2 or 3 places higher then any of your numbers ſtandeth, not regarding the place as before, but onely ſo placing it for your owne remembrance, as you ſee it in the example. Your numbers and generall value thus placed, obſerue what numbers are greater, and what numbers are leſſer then the general value; and taking their differences, place them ſo, that you may ioyne greater with leſſer, and leſſer with greater: for if you ioyne too much with too much, you ſhall haue ſtill too much; and if you ioyne too little with too little, you ſhall haue ſtill too little; ſo that in both theſe, you can neuer come by the deſired meane. Therefore to proceede orderly, take the difference of 43 (your leaſt number) from 50, and you haue 7; place that 7 right againſt 59 (your greateſt number), and likewiſe take the difference of 59 from 50, which is 9, and place againſt 43 your leaſt number, ſo haue you ioyned your greateſt

	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
			4	3			9					
			4	8								
	5	0										
			5	4								
			5	9			7					

	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
greateſt with your leaſt, as you ſee in the example. This done, take the difference of your other 2 nũbers 48 from 50,	5	0	4	3			9		2	2		
			4	8			4			9		
			5	4			2		2	4		
			5	9			7			9	$\frac{9}{11}$	

which is 2, place that againſt 54; 54 from 50, which is 4, place that againſt 48, as you ſee in this example: then adde all the differences together, and they make 22, place that in the place of direct vnities, as in the example. And now muſt you proceed as in Fellowſhip, making the totall of all your differences (the ſaid 22) the firſt number in the Rule of 3; each particular difference, the ſecond number; and 24 (the ounces that you deſire) the third number; therefore ſay by the Rule of 3, If 22 giue 9, what ſhall 24 giue? worke, and you haue $9\frac{9}{11}$ of the firſt ſort. Againe, If 22 giue 4, what ſhall 24 giue? worke and find $4\frac{4}{11}$ of the ſecond ſort: likewiſe $2\frac{2}{11}$ of the third ſort, and $7\frac{7}{11}$ of the fourth ſort; all which added together, maketh 24 ounces, your deſire.

Now to proue your worke, and be aſſured that this mixture commeth to neither more nor leſſe, then iuſt 50 ſhillings the ounce, multiplie 50 (your common value) by 24 (your number of ounces) ſo haue you 1200 ſhillings; then multiplie euerie quantitie by his owne particular value, of the firſt ſort $9\frac{9}{11}$ by 43 ſhillings, ſo haue you $422\frac{2}{11}$ s.; of the ſecond ſort, $4\frac{4}{11}$ by 48 ſhillings, giueth $209\frac{5}{11}$ s.; likewiſe $2\frac{2}{11}$ by 54 s., yeeldeth $117\frac{9}{11}$ s.; laſtly, $7\frac{7}{11}$ by 59 s. yeeldeth $450\frac{6}{11}$ s.; theſe 4 added together, maketh 1200 ſhillings, agreeable to the former totall, which is a moſt certaine proofe of the worke and the mixture, according to your deſire.

But if the ſaid Gold-ſmith were vnwilling to ſpend ſo much

of his fineſt ſort of gold, and deſired rather to haue more of the middle ſorts in his mixture, then muſt you place your numbers in your Table as before, thus: where you ſee we haue linked 43 with 54, and 48 with 59, by placing the one numbers difference againſt the other, then adding all the differences together, maketh 22 as before; with which 22, working as in the former example, ſo haue you $4\frac{4}{11}$ of the firſt ſort, $9\frac{1}{11}$ of the ſecond ſort, $7\frac{7}{11}$ of the third ſort, and $2\frac{3}{11}$ of the fourth ſort: all which added together, maketh 24 ounces as before: likewiſe multiplie 50 (your common value) by 24 (your number of ounces, and the product is 1200 ſhillings: alſo, multiplie each quantide by his owne value, and adde all the products together, and they make as before 1200 ſhillings for the proofe of the queſtion.

in your	x.	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
				4	3			4		2	2		
				4	8			9			4		
	5	0											
				5	4			7		2	4		
				5	9			2			4	$\frac{4}{11}$	

A Mint-maſter hath 4 ſorts of Siluer Bullion, that is, of 12 ounces fine, of 9 ounces fine, of 5 ounces fine, and of 3 ounces fine, by mixing of which together, he would make another ſort of 7 ounces fine; the queſtion is, how much hee muſt take of each ſort for the ſaid mixture? Anſwere. Place your particular ſorts, 12, 9, 5, and 3 in your Table, as in the example following: then ſet 7 (your deſired fineneſſe) aboue them, as you ſee it in the example: this done, linke 12 with 5, and 9 with 3, as you ſee it done by the placing of their differences: then adde all the ſaid differences together, and they make 13, which 13 is a generall denominator to each difference; wherefore wee conclude, that he muſt take $\frac{2}{13}$ of the firſt ſort, $\frac{4}{13}$ of the ſecond ſort, $\frac{1}{13}$ of the third, and $\frac{6}{13}$ of the fourth; or if you will (omitting

ting any	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
denomi-			1	2			2					
nator at												
all) you				9			4					
may con-												
clude, that	7								1	3		
for euerie												
2 ounces				5			5					
of the first												
ſort, he				3			2					
muſt take												
4 of the												
ſecond, 5												

of the third, and 2 of the fourth, which is all one in mixture.

But if the ſaid Mint-maſter, had named any quantitie, as 20 li. waight, or the like, then muſt you make that the third number in the Rule of 3. ſaying, If 13 giue 2, what ſhall 20 giue, and ſo proceeding with the reſt? by which worke you ſhould find $3\frac{1}{11}, 6\frac{2}{11}, 7\frac{2}{11}$, and $3\frac{1}{11}$, which added together, maketh 20 li. waight, your deſire.

A Mint-maſter hath 12 li. waight of ſiluer Bullion, at 10 ounces 15 penny waight (or $\frac{3}{4}$) fine, of which he would make money that ſhould be but 7 ounces 5 penny waight (or $\frac{1}{4}$) fine; the queſtion is, what alay of Copper muſt bee melted with the ſaid 12 li. waight of Siluer, to reduce it to the ſame fineneſſe? Anſwere. Subtract $7\frac{1}{4}$ from $10\frac{3}{4}$, the remaines are $3\frac{1}{2}$, ſo much Copper muſt be melted with $7\frac{1}{4}$ of the ſame Siluer; therefore ſay by the Rule of 3 Direct, If $7\frac{1}{4}$ (or $\frac{29}{4}$) giue $3\frac{1}{2}$ (or $\frac{7}{2}$), what ſhall $\frac{3}{1}$ giue? multiply and diuide, and the quotient giues you $5\frac{1}{4}$ li. 10 penny waight, 8 graines, and $\frac{8}{29}$ of a graine, ſo much Copper muſt be molten with 12 li. waight of Siluer, being $10\frac{3}{4}$ ounces fine, to reduce it into $7\frac{1}{4}$ ounces fine.

A Mint-maſter hath Siluer Bullion of 12 ounces fine, of 10 ounces fine, and of 9 ounces fine, wherewith hee would make money that ſhould be but 7 ounces fine, the queſtion is, what alay of Copper he muſt melt with theſe three ſorts of Siluer? Anſwere. Set 12, 10, 9, and 0, in the 4 rowes of your Table,

and 7, (the desired fineneſſe) aboue them, as in this example, then take the difference of each sort, and place against 0; likewise the difference of 0, and place against each sort, so haue you 10 ounces of Copper, and 7 of each sort for the answere of your question.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
						1	2		7		
						1	0		7		
				7			9		7		
							0		5		
									3		
									2		
									10		

A Mint-master hath Gold Bullion of 15 karrats fine, other of 19 karrats fine, and pure Gold of 24 karrats fine, of which 3 he would make a fourth sort of 21 karrats fine; place your numbers thus: then set the difference of 15 & 19 against 24, likewise the difference of 24 against 15 and 19: so haue you 3 of the first, 3 of the second, and 8 of the third for this mixture.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
					1	5			3		
					1	9			3		
		2	1								
					2	4			6		
									$\frac{2}{4}$		

More, the said Mint-master hath pure Gold of 24 karrats fine, other of 21 $\frac{1}{2}$ karrats fine, the which he would alay to 19 karrats fine, the question is, how much Siluer he must melt with these two sorts to bring them into that fineneſſe? place your

your numbers, thus: then set the differences of 24, and 21 $\frac{2}{3}$, against 0; also the difference of 0 against 24, and 21 $\frac{2}{3}$, so haue you 7 $\frac{1}{2}$ of Siluer, to mixe with 19 of each sort of Gold.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
					2	4		1	9		
					2	1	$\frac{1}{2}$	1	9		
		1	9								
						0			5	$\frac{2}{2}$	
									7	$\frac{1}{2}$	

+ A Gold-smith hath 5 li. waight of Siluer Bullion, at 5 $\frac{1}{2}$ ounces fine, with which he would mixe so much pure Siluer, that it might be of 9 ounces fine, I demand how much pure Siluer serueth for the same mixture? Answere. Place your numbers in your Table, thus: then take the differences of 12 from 9, and 5 $\frac{1}{2}$ from 9, so haue you 3, and 3 $\frac{1}{2}$: this done, say by the Rule of 3,

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
						5	$\frac{1}{2}$		3		
			9		1	2			3	$\frac{1}{2}$	
									5		
									5	$\frac{1}{6}$	

If 3 li. waight of 5 $\frac{1}{2}$ ounces fine require 3 $\frac{1}{2}$ li. waight of pure Siluer, what shall 5 li. waight require? multiplie and diuide, the quotient giues you 5 $\frac{1}{6}$, so many li. of pure Siluer must bee melted with 5 pound Bullion of 5 $\frac{1}{2}$ fine, to bring it into 9 ounces fine.

A Gold-smith hath 19 ounces of Siluer at 9 ounces fine, the

which hee refineth in the fire, vntill it commeth to bee but 15 ounces, I demaund of what fineneſſe it is after this refining? Anſwere by the Rule of 3, If 15 giue 19, what ſhall 9 giue? worke and finde 11 ounces 8 penny waight, ſo many ounces fine is the pound waight thus refined.

A Gold-ſmith hath 25 ounces of Siluer at 7 ounces fine; I demaund to what quantitie he ſhall refine it, that it may bee of 11 ounces 8 penny waight fine? Anſwere by the Backer Rule of 3, If 25 giue 7, what ſhall giue 11 $\frac{8}{20}$? worke, and you ſhall finde 15 ounces 7 penny waight, and $\frac{3}{11}$ of a graine, to that quantitie muſt he refine his 25 ounces in the fire, to bring it to 11 ounces 8 penny waight fine.

If 1 li. waight of Siluer containe 9 ounces 9 penny waight fine, how much fine doth 33 ounces containe? Anſwere. If 1 li. waight or 12 ounces giue 9 ounces 9 d., what ſhall 33 ounces giue? multiplie and diuide, ſo haue you 25 ounces, 14 penny weight, and 18 graines for the anſwere of the queſtion.

If one ounce of Gold containe 21 $\frac{1}{3}$ karrats fine, how much fine doth 16 ounces, 15 penny waight, and 14 graines containe? Anſwere. Say by the Rule of 3, If 1 ounce (or 24 karrats) giue 21 $\frac{1}{3}$ fine, what ſhall 16 ounces, 15 d. 14 graines giue? put your whole numbers into their broken, place them orderly in your Table, then multiplie and diuide, the quotient giues you 14 ounces, 17 d., 3 $\frac{7}{11}$ graines; ſo many karrats fine ſhall the ſaid 16 ounces, 15 d. 14 graines containe, if 1 ounce containe 21 $\frac{1}{3}$ karrats fine. And this may ſuffiſe, for the Rule of Alligation, or mixture.

The Rule of falſe Poſitions.

IT is called the Rule of falſe poſitions, not that it teacheth any falſe-hood, or that the ſame poſitions may not bee truly anſwered, as in any other Rule of Arithmetick, but onely; becauſe thoſe anſweres are framed by fained ſuppoſitions taken at aduenture, which how falſe ſoeuer they be, yet by meanes of thoſe falſe numbers, we can finde out the true number anſwering the queſtion. And this Rule is onely herein different from the rule

of

of 3, that as in the Rule of 3, wee haue alwaies 3 numbers knowne, ſo in this Rule we haue but one number knowne, to the likeneſſe of which we muſt deuiſe two other numbers, and worke vpon them three together, as if they were the true numbers: but for that this Rule is diſtinguiſhed into 2 parts (ſingle and double) that is to ſay, the Rule of one falſe Poſition, and the Rule of two falſe poſitions; we will firſt giue you an example or two of the ſingle poſition.

Queſtion.

A Gentleman dying, and leauing but one Daughter, deliuereth into the hands of his Brother a certaine ſumme of money, couenanting that ſo long as hee kept it, hee ſhould pay to his daughter after the rate of 8 li. in the 100 li. ſimple Intereſt, and at the ende of 7 yeeres the Vncle payeth to the Neece 540 li. for all, both Principall and Intereſt, the queſtion is, what money was deliuered to him at the firſt: For the anſwere of this and ſuch like queſtions, you ſee that wee haue but onely one number to worke vpon, that is 540 li. for the other two numbers, that is, the time and the Intereſt are but onely the meanes to finde out two proportionall numbers to our 540 li., ſo that 540 li. may be in proportion to the number that wee ſeeke, as the one of them is to the other, therefore being vncertain of the true ſum, let vs ſuppoſe that the Brother dying deliuered 300 li. ſet that in the firſt row of your Table, in the ſecond row take the vſe of that 300 li. for one yeere, and you will finde 24 li. (after 8 li in the 100 li) multiplie that 24 li. by 7, ſo haue 168, which is the vſe of the ſaid 300 for 7 yeeres: this done, adde the ſaid Intereſt into the principall 300 li., and you haue 468 li. and 300 li. for the two other numbers in the Rule of 3, therefore ſay, If 468 li. be come of 300 li., of what ſhall come 540 li., place your numbers orderly in your Table; then multiplie and diuide, and you ſhall finde 346 li. 3 s. $\frac{5}{13}$, which was the money deliuered at the firſt.

An vſurer deliuereth to a Merchant a ſumme of money, to be paied after the rate of 10 li. in the 100 li. Intereſt vpon Intereſt, and at the ende of 4 yeeres he demaundeth of the Merchant 300 li., the queſtion is, what money was deliuered? ſuppoſe 100 li., then as you are taught in Intereſt vpon Intereſt, take

the

the vse of 100 li. for a yeere, and you shall find 146 $\frac{41}{100}$ li., and now as in the worke aforegoing, haue you three numbers to worke vpon; therefore say by the Rule of 3, If 146 $\frac{41}{100}$ li. become of 100 li., of what shall come 300 li.? multiplie and diuide, and finde 204 li. 18 s. $\frac{1181}{14641}$, so much was deliuered in ready money.

A Gentleman hath a garden-plot of 120 yards square to be digged, and he setteth three labourers on worke thereon; to the first he giueth 18 d. the day, to the second 12 d., and to the third 9 d.; and his reason is, because the first can doe it all in 2 daies, the second will require 3 daies, and the third 4 daies: now the question is, working together, in what time they will dispatch it? Suppose they will doe it in one artificiall day, that is in 12 houres; then must the first doe the $\frac{1}{2}$, that is 60 yards; the second the $\frac{1}{3}$, that is 40; and the third $\frac{1}{4}$, that is 30: these three 60, 40, and 30 added together, maketh 130, but wee should haue but 120, therefore say by the Rule of 3, If 130 giue but 120, what shall 12 giue? multiplie and diuide, and you haue 11 houres, 4 minutes, and $\frac{4}{13}$ of a minute; in that time will the three workemen dispatch it.

The Rule of two false Positions.

WHerein you must obserue, that when any question belonging to this Rule is propounded, you must first imagine some number at your pleasure, and that number you shall call the first position, wich which you shall worke, as if it were the right number, according to the nature of the question. And if you finde that you missed the truth, then is the number produced too much, or too little, which you shall note in your Table, in the place of farthings, by opening 2 thus -- if it be too much, and but one thus - if it bee too little, and that shall be your first error; set that in the first row of your Table, with his error and signe too much -- or too little -, as you shal perceiue by our examples: then take some other number greater or lesser, as you see cause, and that shall be your second position, worke vpon that, as on the former. And if you haue misse[d] againe, note the excesse, or want, and set that position with

with his error, in the ſecond row of your Table, with his ſigne more thus ~, or leſſe thus . ; then multiplie croſſewiſe (as in diuiſion of fractions) the firſt poſition by the ſecond error, and likewiſe the ſecond poſition by the firſt error; theſe two products ſtanding in the firſt and ſecond row of your Table, obſerue the ſignes of your errors whither they be both alike, that is both too much, or both too little; and if they be both alike, then ſubtract the leſſer product from the greater, and the remaines ſhall be your diuidend; likewiſe ſubtract the leſſer error from the greater, and the remaines ſhall be your diuiſor; ſo diuiding the one by the other, the quotient giueth the iuſt number you ſeeke for. But if the errors be vnlike, that is to ſay, the one too much, and the other too little, you muſt then adde the two products together for your diuidend, and alſo the two errors for your diuiſor, ſo diuiding, the quotient is the number you deſire, and this is all you are to obſerue in the Rule of two falſe poſitions; therefore remember, that the ſignes alike require ſubtraction, and vnlike ſignes require addition.

A Noble man willing to reward three of his ſeruants giueth 200 li. among them, ordering, that the ſecond ſhall haue twice ſo much as the firſt, and 9 li. ouer; and the third ſhall haue three times ſo much as the firſt, leſſe by 17 li.; I demaund what each of them muſt haue? Anſwere. Suppoſe the firſt muſt haue 45 li., then muſt the ſecond haue 99 li., and the third muſt haue 118

pound by the order of the queſtion; theſe 3 added together, maketh 262 li., and we muſt haue but 200 li., therefore the firſt errour is too much by 62 li.; we therefore ſet our	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.	
									4	5	6	2	..
									4	0	3	2	..

firſt poſition 45 with his error 62 in the firſt row of our Table, as in the former example; and becauſe the errour is too much, we open 2 in the place of farthings, as you ſee in the example; then wee take ſome other number, and ſuppoſe the firſt muſt haue but 40 li., then muſt the ſecond haue 89 li., and the third 103 li.; theſe three added together, maketh 232 li., ſo we haue ſtill 32 li. too much, we ſet our ſecond poſition 40, with his error 32, and his ſigne too much, in the ſecond row of our Table, as in the example; then we multiplie croſſe-wiſe 45, the firſt poſition, by 32 the ſecond error, and the product is 1440: likewiſe multiplie 40, the ſecond poſition, by 62 the firſt error, and the product is 2480. Now becauſe the ſignes are like, therfore ſubtract the leſſer product from the greater, that is, 1440 li. from 2480 li., the remaines will be 1040 li. for your diuidend: Likewiſe ſubtract the leſſer error from the greater, that is, 32 from 62, the remaines is 30 for your diuiſor. Finally, diuide 1040 by 30, and the quotient giues you 34 li. 13 s. 4 d., for the firſt mans part, and conſequently 78 li. 6 s. 8 d. for the ſecond, and 87 li. for the third: which three added together, maketh iuſt 200 li. for the proofe of the queſtion.

Two Foote-men runne for a wager, the firſt by Arithmeticall Progreſſion, hauing 156 ſtones, euery one placed one yard from the other, and a basket ſet iuſt one yard from the firſt ſtone, into which he muſt put the ſtones as he gathereth them one after the other: the ſecond Foote-man muſt runne foure miles forth and back, that is in all 8 miles: now the agreements is betwixt them, that at the returne of this Foot-man, for euery ſtone that he findeth thus put into the basket, he muſt giue the other Foot-man 9 d.; and for euery ſtone that wanteth, the other Foote-man muſt giue him 13 d.; now being returned, and making the accounts euen, it is found that the ſecond muſt haue of the firſt 7 s. 8 d.: I demaund how many ſtones were in the basket, and how many wanted of the 156 ſtones? Anſwer. Suppoſe there were 90 ſtones in the basket, then was there 66 wanting of the 156; therefore ſee firſt what 90 commeth to at 9 d. the piece, and you haue 810 pence: Likewiſe ſee what 66 commeth to at 13 d. the piece, and you will finde 858 pence, ſubtract 810 from 858, and there remaineth 48 d., that

is

is 4 s. for the ſecond footeman, but hee ſhould haue 7 s. 8 d., that is 92 pence, therefore abate 48 from 92, reſt 44, ſo our firſt error is 44 too little, we ſet our poſition 90, with his error 44, and ſigne too little in the firſt row of our Table, thus: then we take ſome other number, ſuppoſing 84 ſtones in

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.	
								9	0	4	4	·
								8	4	8	8	··

the basket, and 72 wanting, we ſeeke what 84 commeth to at 9 d., and finde 756 d.: likewiſe what 72 giueth at 13 d., and we finde 936 d., we ſubtract 756 from 936, remaineth 180, but we ſhould haue but 92, therefore the ſecond error is too much by 88, we ſet our ſecond poſition 84, with his error 88, and ſigne too much in the ſecond row of our Table, as in the example: then we multiplie croſſewiſe 90 our firſt poſition, by 88 our ſecond error, and the product is 7920. Againe, wee multiplie 84 our ſecond poſition by 44 our firſt error, and this product is 3696. Now becauſe our errors are vnlike, that is to ſay, the firſt too little, and the ſecond too much, we therfore adde our two products together, and they make 11616, alſo we adde our errors together, and they make 132. Finally, we diuide our products by our errors, that is 11616, by 132, and the quotient giueth 88, ſo many ſtones were in the Basket, at the returne of the ſecond foot-man, and by that reaſon 68 wanted. For the proofe of this, multiplie 88 by 9 d. the value of each ſtone gathered, and you haue 792 d.: alſo multiplie 68 by 13 d., the value of each ſtone wanting, and you haue 884 pence; ſubtract 792 from 884, remaineth 92 pence, that is 7 s. 8 d., the iuſt money that the ſecond foote-man had of the firſt, wich is the proofe of the queſtion.

A Grocer hath bought Cloues and Mace, as many li. waight as came to 84 li. in money, the Cloues at 6 s. the li. waight, and the Mace at 7 s. 6 d. the li. waight; and being long after demaunded how much he had of each ſort: he anſwered, that hee could neither tell the particulars of the Cloues, of the Mace, nor of the totall; onely he remembred, that the Cloues came to iuſt 6 li. more then the Mace: now I demaund how much hee had of each ſort, and what the totall was? Anſwere? ſuppoſe he had 100 li. waight of Cloues, which at 6 s. the li. commeth to 30 li. in money, which 30 li. abated from 84 li., leaueth 54 li. for the value of the Mace, by which reckoning the Mace commeth to more then the Cloues by 24 li.: but the Cloues ſhould come to more then the Mace by 6 li., ſo appeareth, that the firſt error is too little by 30 li., we therfore ſet 100, our firſt poſition, with his error 30, in the firſt row of our Table, thus: then we take ſome other number, imagining that hee had 130 li. of Cloues, whoſe value commeth to 39 li.,

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
							1	0	0	3	0
							1	3	0	1	2

which taken from 84 li., leaueth 45 li. for the value of the Mace, which is 6 li. more then the value of the Cloues, but the Cloues ſhould bee 6 li. more then the Mace, therefore the ſecond error is too little by 12 li., we ſet our poſition 130, with his error 12, & his ſigne too little in the ſecond row of our Table, as in the example: then we multiplie croſſewiſe 100, the firſt poſition by 12, the ſecond error, it produceth 1200: likewiſe 130 the ſecond poſition by 30, the firſt error, produceth 3900. Now the ſignes being alike, that is both too little, we abate the leſſer product 1200 from 3900 the greater product, the

the remaines are 2700 for the diuidend. Alſo we ſubtract the leſſer error 12, from the greater error 30, remaineth 18 for the diuiſor; ſo diuiding 2700 by 18, giueth in quotient 150, ſo many pound of Cloues had the ſaid Grocer. Now to find how many pounds of Mace hee had; you muſt firſt know the value of your 150 li. of Cloues, which at 6 s. the li. waight, amounteth to 45 li., then remaines of the 84 li. but 39 li. for the value of the Mace (ſo you ſee the Cloues are iuſt 6 li. more then the Mace). Laſtly ſay, If 1 li. waight coſt 7 s. 6 d., or $\frac{3}{8}$ li. how many li. waight for 39 li.? Multiply and diuide, the quotient giues you 104 li. waight of Mace, ſo the anſwer is, that the ſaid Grocer had 150 li. of Cloues, 104 li. of Mace, and 254 li. waight of Cloues and Mace together: and thus we conclude our Rule of falſe poſitions.

The extraction of the Square Roote.

A Square Roote is any digit or other number, which being multiplied by it ſelfe, produceth a ſquare number, of which the firſt multiplier is the roote; as 5 multiplied by 5, produceth 25, a ſquare number, whereof 5 the firſt multiplier, is the ſquare Roote. Likewiſe 7 multiplied by 7, produceth 49 a ſquare number, whereof 7 is the ſquare Roote; and is called the Roote, becauſe it is the ſide or beginning of any ſquare quantitie; which roote, ſide, or beginning, conſidered in it ſelfe, is imagined to be a ſtraight line, hauing onely length, without bredth or thickneſſe: but conſidered in a ſquare forme, as being 7, 8, or 9 inches, feete, ells, or pearches euery way, then is it a ſquare ſuperficies, hauing length and bredth, whoſe any ſide is the beginning reſpecting quantitie, and the roote reſpecting number. As if wee had a piece of board, ſtone, or glaſſe, that were 9 inches ſquare, and deſired to know how many ſquare inches were in the ſame ſuperficies, multiplying 9 by 9, we finde it to containe 81 ſquare inches. Againe, if we had 81 ſquare inches in length, and would know what ſquare the ſaid length would beare, by taking the ſquare roote of 81, we finde that it will be 9 inches ſquare, that is, 9 inches euery way. And thus of feete, elles, pearches, or whatſoeuer.

Now for your eaſe and furtherance in taking the ſquare roote of any number, you muſt firſt know the ſquare number of any digit: for as the 9 digits are the originall of all numbers, ſo the ſquares of thoſe digits are the ſecond originall of all ſquare numbers, all which it is expedient that you know & remember, becauſe in euery extraction, you muſt vſe all, ſome, or (at the leaſt) one of them, of which this ſmall Table will bee ſufficient for your inſtruction, therefore we will now giue you examples, according to the methode of our Table; then which there is no worke more eaſie, pleaſing, delightfull, or more excellent, nor any meanes that can bee found worthie to bee compared withall, for extracting the Square or Cube Root of any number whatſoeuer.

Rootes.	*Squares.*
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81

Example.

Let 1369 bee the number giuen, whereof we are to extract the ſquare roote, to doe which we place the ſame number in the firſt row of our Table as in this example: then to know of how many figures our roote wil conſiſt, we open a vnitie in the firſt place of the ſecond row, and leauing one place betweene, we open another vnity in the third place, as you ſee it repreſented by two pricks vnder our giuen number in the Table, wherby we know, our roote will conſiſt onely of two figures. This done, we ſeeke for the greateſt ſquare number in 13, (the number

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
							4				
						x	3	6	9		
				1				6			
							4	2			
								4	9		
							4	6	9		
								3	7		

ber ouer the laſt pricke) which ſquare number is 9, that 9 wee cancell out of 13, remaineth 4, the roote of that 9 is 3, which 3 we ſet in the place of tenns, in the third row for the firſt figure of our roote, which muſt conſiſt but of two figures, and therefore the firſt figure ſtandeth in the ſecond place, as you ſee it all done in the firſt worke of the example: this done, ſet the ſame 3 (your roote found) a place beneath the laſt pricke, and there double it, making 6, as you ſee it done in the example, then examine how many times 6 in 46, (the number aboue 6) wherein you muſt alwaies obſerue to take it but ſo many times, as that you may leaue a ſufficient remaine to multiplie the ſaid 6 by the number of times that you take it, and alſo to adde into the product, the ſquare number of the laſt figure; wherein it is better to take it twiſe too little, then once to much, but in this worke you may bee bold to take it 7 times, becauſe you ſhall ſtill leaue 49 remaining; therefore ſet 7 for the ſecond figure of your roote, as you ſee it ſet in the example: then by that 7 multiplie your 6, the product is 42; to which 42 ad the ſquare number of 7, which is 49, all maketh 469, to be ſubtracted from 469, as you ſee it ſtand in order in the example, after which ſubtraction nothing remaining, manifeſteth 1369 to be a direct ſquare number, whereof 37 is the roote: for proofe of which, if you multiplie 37 by 37, you will produce 1369, as before: and thus haue you the firſt way of extracting the ſquare roote by our Table: for a ſecond way (which I hold to bee the plainer) obſerue this example following.

If 591361 were giuen to haue the ſquare roote extracted, place your giuen number in the firſt row of your Table, and vnder euery ſecond place open a vnitie, as in this example following; whereby you perceiue, that your roote will conſiſt of three figures: this done, take the greateſt ſquare number that may bee found in 59 from 59, the number ouer your laſt pricke, which ſquare number is 49, and taken from 59 leaueth 10, the roote of which 49 is 7, that 7 ſet in the third row of your Table, & in the third place of that row, becauſe your roote muſt conſiſt of 3 figures, all which you ſee done in the next example: then ſet the ſame 7 againe a place beneath your laſt pricke, and there double it, making 14: then examine how ma-

ny

ny times	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
1, the first					1	3	7					
figure of					9	1	3	6	1			
14 may						1	4	6				
be had in						8	7	6				
10, the								7	6			
number							1	5	2	9		
ouer it,						1	3	7	6	1		
where you								7				
may haue									6			
10, 9 8,										9		
or 7 times												
1, but then												

can you not leaue remaines, ſufficient for the ſucceeding multiplication, and the addition of the ſquare number, of which we haue ſhewed you in the worke aforegoing; therefore you muſt allow but 6 times 1 to be taken out of 10, and that 6 you muſt ſet beneath the other figure of your roote, and alſo beneath your 14, as you ſee in the example: then by that 6 multiplie the whole 146, that is the 14 aboue it, and alſo the 6 it ſelfe, the product will be 876, which 876 you muſt ſubtract from 1013, the number aboue the ſecond pricke, remaineth 13761 ouer the laſt pricke. Now to proceede in order, ſet 6 (the laſt figure of your quotient or roote) a place lower then the former, and 7 aboue it, as it ſtandeth in your quotient, and as you ſee it ſet in the example, and there double the whole quotient, it produceth 152: this done, examine how many times 1 in 13, where you muſt note, that no one place beareth aboue 9; therefore firſt finding that it will beare the ſucceeding multiplications, with the addition of the ſquare number of 9, allow 9 to be the laſt figure in your roote, and ſet it in the laſt place of your roote, and likewiſe a place beneath your diuiſor 152, as in the example; ſo haue you made your roote 769, and your diuiſor 1529. Now by this 9, the laſt figure found, multiplie your whole diuiſor 1529, and the product will bee 13761, equall to your former remaines; whereby appeareth, that 591361 is an euen ſquare number, whereof 769 is the roote, as the worke manifeſteth.

If

If 9290304 were giuen to haue the ſquare roote extracted, place your giuen number in the firſt row of your Table, thus, and vnder each ſecond figure open a vnitie or pricke, as you haue done before. This done, take the greateſt ſquare number in 9 (the number ouer your prick) which is 9, whoſe roote is 3, therefore cancell the ſaid 9, and ſet his roote 3 in the third row, and the fourth place of that row, as in the example: then double 3 your root found, in the ſecond row of your table, a place beneath your laſt prick, as you ſee in the example. Now becauſe 6 the doubled quotient is greater then 2, the number ouer it, you muſt allow a cypher in your quotient, and ſet the ſaid 6 a place lower, as you ſee it done in the example. Being thus ſet lower, examine how many times 6 in 29 (the number now come to be aboue it) where you haue 4 times 6, and you may bee bold to take it, becauſe the remaines will beare the multiplication of 6 by 4, and alſo the ſquare number of 4; therfore ſet 4 in your roote beneath your Cypher, and alſo beneath 6 your diuiſor, leauing a Cypher between either, as you ſee we haue done; then multiplie both 6 and 4, by 4, & your diuiſor is 2416; which being ſubtracted from 2903, the number aboue the ſecond prick, leaueth remaining 48704 for the number aboue our third and laſt prick, therefore ſet the whole quotient doubled a place lower, then where you made your laſt ſubtraction, ſo haue you 608; then examine how many times 6 in 48, and the anſwere is 8 times 6; therefore ſet 8 in the laſt place of your roote, and alſo a place beneath your former diuiſor, ſo haue you 3048 for your roote, and 6088 for your diuiſor,

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
						4	8	7			
			9	2	9	6	3	0	4		
				6							
						6	0	4			
				2		4	1	6			
							6	0	8	8	
						4	8	7	0	4	
							3	0	4	8	

for, by which 8 (the laſt figure) multiplie your whole diuiſor 6088, and the product will be 48704, agreeable to the former remaines, whereby appeareth, that 9290304 is a right ſquare number, whereof 3048 is the roote, which you may prooue by multiplying 3048 into it ſelf, that is, by 3048, and the product will be 9290304, your firſt giuen number, and thus haue you three different examples, whereby you may bee inſtructed for the extraction of any ſquare roote whatſoeuer.

If the giuen number (whereof you would take the roote) be a ſurd number, that is to ſay, not directly ſquare, then muſt you take the greateſt ſquare roote that may bee found in it, and allow the reſt for a remaine; as if you would take the ſquare roote of 1385, by working according to your former inſtructions, you will finde 37 for your roote, and 16 remaining; whereby appeareth, that 37 is the greateſt ſquare roote contained in 1385: likewiſe if you would take the ſquare roote of 210, you will finde 14 for your roote, and 14 remaining, and thus of all other, wherein you ſeeke but the roote in it whole number, not reſpecting the remaines or ouer-plus, as in theſe two examples; of which (and all other of this nature) the vſuall proofe is, to multiplie the root found, into it ſelfe ſquarely, and into the product, adde the remaines, ſo ſhall it returne the firſt giuen number. But if you deſire a neerer roote then the whole number, then may you ſet your giuen number, 2, 4, 6, or 8, places higher in your Table, and ſo take the roote downeward, ſo farre as you can take it. And (omitting the remaines, as being to ſmall purpoſe) of the roote thus taken for euery two places, that you ſet it higher, cut off one figure from the roote; as if you ſet it eight places higher, cut off foure figures; if you haue ſet ſixe places higher, cut off three figures; if foure, two, &c. Now theſe figures thus cut off, the number aboue them ſheweth the root in it whole number, and the ſame figures ſet as numerator to a vnity in a higher place, commeth ſomewhat neere the fraction to be ioyned with it, all which I ſhall make plaine vnto you by an example. Let 43 be the number, whereof you deſire the neereſt ſquare root; you know that 36 is the greateſt ſquare number in 43 (whoſe roote is 6), now 36 taken from 43, leaueth 7 remaining, which 7 is too much to be omitted;

therefore

therefore to come by a neerer roote, ſet 43 eight places higher in your Table, and vnder each ſecond figure open a vnitie, as in this example, ſo ſhall you finde, that your root will conſiſt of 5 figures, therefore take the greateſt ſquare roote that you can finde in 4300000000, and you ſhall haue 65574 for your roote, and 50524 remaining (which you may reiect as impertinent). Now becauſe you ſet your giuen number eight places higher, therefore cut off the firſt foure figures of your roote, ſo haue you 6 for your whole number, and 5574 for the numerator of your fraction; to which ſet 1 a place higher for denominator, ſo haue you $6\frac{5574}{10000}$ or $6\frac{2787}{5000}$ for the neereſt ſquare roote of 43; which if you multiplie into it ſelfe, you wil finde that it wanteth but $\frac{32635}{1000000}$ of the firſt number, which is little more then the $\frac{1}{100}$ part of a vnitie, and ſome ſuch defect or want will alwaies be found in this kinde of extraction by the loſſe of our remaines; neuertheleſſe this rule is to bee accepted as a very excellent Rule, for extracting the neereſt ſquare roote of any ſurd number whatſoeuer: for you ſhall ſeldome finde a number more vneuen then 43, of which I haue ſhewne you an example; yet I will now ſhew you another manner of working in the next example.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
								4	3		
4	3	0	0	0	0	0	0	0	0		
					5	0	5	2	4		
					6	5	5	7	4		
									6		
						5	5	7	4		
					1	0	0	0	0		

When you haue any ſurd number giuen, whereof you deſire the neereſt ſquare roote, ſet the giuen number in the firſt row of your Table, and extract from it, the greateſt ſquare number that may be found in it, the roote of which number, ſet in the third row of your Table; then in the ſecond row, double the roote found, and ſet that as denominator to your remaines, ſo

ſhall you haue a roote ſomewhat too great for your firſt giuen number; therefore to draw it neerer, multiplie the whole roote found, into it ſelfe ſquarely, and from the product abate the firſt giuen number, then diuide the remaines by the whole roote doubled, and ſubtract the quotient from the roote found, the remaines ſhall giue you the neereſt ſquare roote of that number.

Example.

Let 74 be the number giuen, of which you deſire the neereſt ſquare roote, ſet 74 in the firſt row of your Table, and ſubtract from it, the greateſt ſquare number contained in it, which is 64 and taken from 74, leaueth 10 remaining, and giueth 8 for the roote, that 8 ſet in the third row of your Table; then in the ſecond row double 8 (the roote found) making 16, allow that as denominator, and your remaines as numerator, ſo haue you 8, and $\frac{10}{16}$, or $\frac{5}{8}$ for the roote (yet found) of 74: but this is ſomewhat too much, therefore to draw it yet neerer, multiplie $8\frac{5}{8}$ (or $\frac{69}{8}$) into it ſelfe ſquarely, and the product will be $4761/64$, which reduced into vnities, giueth $74\frac{25}{64}$, from which take away 74, remaineth $\frac{25}{64}$, which muſt be diuided by the double of $8\frac{5}{8}$ (the roote yet found) that is by the double of $\frac{69}{8}$, which is $\frac{69}{4}$; ſo diuiding $\frac{25}{64}$ by $\frac{69}{4}$, the quotient giues you $\frac{100}{4416}$, which muſt bee ſubtracted from $\frac{69}{8}$ (the roote already found) and the remaines is the neereſt ſquare roote of 74, therefore reduce $\frac{69}{8}$, and $\frac{100}{4416}$, all into one denomination, and you ſhall haue $\frac{304704}{35328}$ for your $\frac{69}{8}$, and $\frac{800}{35328}$ for your $\frac{100}{4416}$. Now if you ſubtract 800 from 304704, the remaines will bee $\frac{303904}{35328}$ for the neereſt ſquare roote of 74, which reduced into vnities, and the fraction abbreuiated giueth $8\frac{661}{1104}$; this being multiplied ſquarely, giueth 74, and $\frac{625}{1218816}$, which is not the 1950 part of a vnity, different from the firſt giuen number; and thus haue you a moſt excellent and infallible rule for extracting the neereſt ſquare roote of any ſurd number whatſoeuer, which Rule the Author of the Path-way to knowledge, calleth Tartagliaes Rule, and alſo himſelfe very excellently deſcribeth the ſame: but for that it is ſomewhat difficult to bee vnderſtood, and laborious in the working, I will now ſhew you a rule nothing inferior vnto it, which you may vnderſtand with more eaſe, and worke with leſſe labor.

When

When you haue taken the greateſt ſquare roote that can bee found in any ſurd number giuen, if your remaines and your roote bee equall, then double the roote found, and ſet that as denominator to your remaines: likewiſe double the root found and adde one into the product, and make this a ſecond denominator to your remaines; ſo haue you two fractions differing but one vnitie, and yet the one too much, and the other too little, very neere in equall proportion; therefore the meane betwixt theſe two, muſt needes be the neereſt ſquare roote, that can be taken of that number: which if you rightly vnderſtand, you will find many excellent Rules by it, for taking the neereſt ſquare roote of any number whatſoeuer. And that you may rightly vnderſtand, both how to finde the meane proportion, and alſo to apply it diuerſly, I will giue you diuers examples, wherein the remaines ſhall be equall aboue and beneath your roote, and yet in all theſe you ſhall bee able to extract the neereſt roote that can be extracted.

Example.

Let 650 bee the ſurd number, whereof I deſire the neereſt ſquare roote, I take the greateſt ſquare root contained in 650, which I finde to be 25, and alſo 25 remaining. Now becauſe my remaines and my roote are equall, therefore I double my roote found, making it 50, ſo haue I $\frac{25}{50}$ (or $\frac{1}{2}$) for my firſt fraction, this I ſet in the firſt row of my Table, as in this example, and I know it to be too much, therefore to my doubled roote I adde one, making it 51 for the denominator to my remaines, ſo haue I $\frac{25}{51}$ for my ſecond fraction, which I ſet in the ſecond

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
									1		2
								5	1		
								2	5	5	1
								5	0		
							1	0	2		
							1	0	1		
							2	0	4		

ſecond row of my Table, and know it to be too little. Now to come by the meane, I reduce theſe 2 fractions $\frac{1}{2}$ and $\frac{25}{51}$ into one denomination, and I find $\frac{51}{102}$ for my $\frac{1}{2}$, and $\frac{50}{102}$ for my $\frac{25}{51}$, the numerators of which two fractions I ad together, and they make $\frac{101}{102}$. Now if this numerator were euen to take the halfe of it, were the meane proportion; but being odde, double the denominator, and ſo haue you $\frac{101}{204}$ for the fraction to be ioyned with your roote found; whereby you perceiue, that $25\ \frac{101}{204}$ is the neereſt ſquare roote of 650, which multiplied into it ſelfe ſquarely, produceth $650\ \frac{1}{41616}$ which difference were it many degrees greater, were (in this worke) little to be regarded; and this is a generall and infallible Rule in all queſtions, wherein your roote and your remaines are equall: but you may worke this, or any ſuch like (if you pleaſe) otherwiſe, by doubling your roote, and making $\frac{25}{50}$, and againe making $\frac{25}{51}$. Now the numerators of theſe two fractions, being like numbers, you may reiect them both, and adde the denominators (50 and 51) together, ſo haue 101 for your numerator; then take the greateſt denominator 51, and multiplie it by 4, ſo haue you 204 for the denominator as before. Or (if you pleaſe) thus; double your roote found, and adde one into the product, and after this addition, multiplie it by 4, and this ſhall be the denominator of your fraction; then multiplie the remaines by 4. and after the multiplication adde one into the product, and this ſhall be the numerator of your fraction, euery of theſe waies is moſt certaine when the roote and the remaines are equall.

But if your remaines be greater then your roote, then muſt you double your root found, for the denominator, and ſet your remaines as numerator to your firſt fraction, which wil be ſomwhat too much; therfore againe into the doubled root, ad one, and ſuch a part of one, as your remaines are greater then your root, making this the denominator to your remaines as before. Now this latter fraction will bee verie neere in the ſame proportion too little, that the former is too much, ſo the meane muſt needs be the neereſt ſquare roote of the giuen number.

Example.

Let 93 be the number, of which I deſire the neereſt ſquare roote, I take 81 (the greateſt ſquare number in 93) from 93, ſo haue

haue I 12 remaining, and 9 for my roote, which 9, I double, making 18 for the denominator to my remaines, so haue I $\frac{12}{18}$ of $\frac{2}{1}$ for my first fraction, this I set in the first row of my Table, thus, and allow it (as it is) too much: then I consider that 12 (my remaines) is 9 (my roote) and $\frac{1}{1}$ of 9, therefore

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
									2		3
								5	8		
								4	8	2	9
								5	4		
							1	1	2		
								5	6		
								8	7		

to 18 (my doubled roote) I adde one, and $\frac{1}{1}$ of one, making 19 $\frac{1}{1}$ for the denominator to 12 (my remaines) this done, I multiplie 19 by 3, and into the product I adde one for the $\frac{1}{1}$, so haue I 58 for the denominator; likewise I multiplie 12 by 3 making 36 for the numerator, by which meanes I haue $\frac{36}{58}$, or $\frac{18}{29}$ for my second fraction, and this last is very neere in the same proportion too little, that the other is too much, therefore reduce these two fractions, $\frac{2}{1}$ and $\frac{18}{29}$ into one denomination, so haue you $\frac{58}{87}$ for your $\frac{2}{1}$, and $\frac{54}{87}$ for your $\frac{18}{29}$; this done, adde the two numerators together, and you haue 112, which (being euen) take the halfe 56 for the numerator to 87, and thus haue you $\frac{56}{87}$ for the meane proportion, and the fraction to be ioyned with your root found, whereby appeareth, that $9\frac{56}{87}$ is the neereſt ſquare roote of 93, which if you multiplie into it ſelfe ſquarely, you will finde $93\frac{4}{7569}$, which is ſomewhat leſſe then the 1892 part of a vnitie, different from the first giuen number.

Againe, let 45 be the number, of which I deſire the neereſt ſquare roote, I take 36 from 45, ſo haue I 9 remaining, and 6 for my roote; then I double 6, making it 12, ſo haue I $\frac{9}{12}$ or $\frac{3}{4}$ for my first fraction, which I ſet in the first row of my Table, as before; this done, becauſe 9 (my remaines) is 6, and halfe 6,

therefore

therfore I ad 1 $\frac{1}{2}$ into 12 (my doubled roote) ſo haue I 13 $\frac{1}{2}$ for the denominator of my ſecond fraction; then I double 13 $\frac{1}{2}$, making 27, and alſo 9 making 18, and thus haue I $\frac{18}{27}$, or $\frac{2}{3}$ for my ſecond fraction; theſe two fractions, that is, $\frac{3}{4}$ and $\frac{2}{3}$ I reduce into one denomination, and I finde $\frac{9}{12}$ for my $\frac{3}{4}$, and $\frac{8}{12}$ for my $\frac{2}{3}$; the numerators of which two fractions I adde together, and they make 17, of which the $\frac{1}{2}$ were the meane proportion: but being an odde number, I double the denominator 12, and ſo haue I $\frac{17}{24}$ for the fraction to bee ioyned with my roote found; whereby I approue, that 6 $\frac{17}{24}$ is the neereſt ſquare roote of 45, which multiplied into it ſelfe ſquarely giueth 45 $\frac{1}{176}$, and thus haue you two examples, wherein your remaines are greater then your roote.

When your remaines are leſſe then your roote found, then muſt you double your roote, and ſet that product as denominator to your remaines for the firſt fraction; and to finde a ſecond fraction in the ſame proportion too little, that this is too much, you muſt (if it may be) ad ſuch a part into your remaines, as may make them euen with your roote, and the like part muſt be added into your doubled roote, that is added into your remaines: but if they be ſo vneuen, that you cannot adde a like part into either, then double, triple, or quadruple both your remaines, and your doubled roote, till you haue made your remaines greater then your roote found, and afterwards adde one (and ſuch a part of one, as your remaines are made greater then your roote found) into the denominator, and this ſhall bee your ſecond fraction to worke vpon, as you are taught before, of both which I will giue an example: Let 87 bee the number, of which I deſire the neereſt ſquare roote, I take 81 from 87, remaineth 6, and the roote of 81 is 9, ſo haue I 6 remaining, and 9 for my roote, then I double 9 (my roote found) making 18, ſo haue I $\frac{6}{18}$, or $\frac{1}{3}$ for my firſt fraction, which I ſet in the firſt row of my Table. And becauſe 6 (my remaines) is leſſe by $\frac{1}{2}$ of 6, then 9 (my roote) I adde $\frac{1}{2}$ of 6 to 6, making my remaines 9, equall to my roote; and likewiſe I adde $\frac{1}{2}$ of 18, to 18 (my doubled roote) ſo haue I $\frac{9}{27}$. Now my remaines and my roote being thus made equall, I adde one to 27, making $\frac{9}{28}$ for my ſecond fraction, which is in the ſame proportion

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tion to little, that $\frac{1}{3}$ is too much; therefore to come by the meane proportion (which is the neareſt roote), I reduce $\frac{1}{3}$ and $\frac{2}{28}$ into one denomination, and finde $\frac{28}{84}$ for my $\frac{1}{3}$, and $\frac{27}{84}$ for my $\frac{2}{28}$; theſe added together, maketh $\frac{55}{84}$, of which the $\frac{1}{2}$ is $\frac{55}{168}$ for the meane proportion, and the fraction to be ioyned with my roote found; whereby I approue, that $9\frac{55}{168}$ is the neareſt ſquare roote of 87, which being multiplied into it ſelfe ſquarely, giueth $87\frac{1}{28224}$. And this is a generall rule to worke by, whenſoeuer your remaines and doubled root may haue one and the ſame equall part added into them, thereby to make your remaines and roote found, equall.

Againe, let 38 bee the number of which I deſire the neereſt ſquare roote, I take 36 from 38, ſo haue I 6 for my roote, and 2 remaining; I double 6, making 12 for the denominator of my firſt fraction, ſo haue I $\frac{2}{12}$ or $\frac{1}{6}$; this done, I multiplie 2 (my remaines) by 3, making it 6 (equall to my roote found); likewiſe I multiplie 12 (my doubled roote) by 3, making it 36, ſo haue I $\frac{6}{36}$ (equall to $\frac{1}{6}$); then I adde one to 36, and thus haue I $\frac{6}{37}$ for my ſecond fraction; of theſe two, that is, $\frac{1}{6}$ and $\frac{6}{37}$, I take the meane proportion, as I haue taught in the workes aforegoing, and I finde $\frac{73}{444}$ for the fraction to bee ioyned with my roote found, approuing that $6\frac{73}{444}$ is the neereſt ſquare roote of 38, which being multiplied into it ſelfe ſquarely, giueth $38\frac{1}{197136}$; and thus muſt you alwaies do, when your remaines is any euen part of your roote.

To conclude, whether your remaines bee euen or vneuen, whether equall, exceeding, or wanting of your roote, take this for a generall rule, that you double your roote found, and abbreuiate that with your remaines for your firſt fraction; then multiplie your doubled roote by your roote found, and into the product adde your whole remaines, and this ſhall bee the denominator of your ſecond fraction; alſo multiplie your whole remaines by your roote found, and this ſhall bee the numerator of your ſecond fraction, the meane proportion (betwixt which and your firſt) ſhall be the fraction to bee ioyned with your roote, of which I will giue you one example, that ſhall be ſufficient for your inſtruction in all other.

Let 55 be the number, of which you deſire the neereſt ſquare

roote, take 49 (the greateſt ſquare number in 55) from 55, ſo haue you 7 for your roote, and 6 remaining; this done, double 7 (the roote found) making 14, which muſt be ſet as denominator to 6, ſo haue you $\frac{6}{14}$, or $\frac{3}{7}$ for your firſt fraction; then multiplie 14 (your doubled roote) by 7 (the roote found), and the product will be 98, into which adde 6 (your whole remaines), and then haue you 104 for the denominator of your ſecond fraction. Againe, multiplie 6 (your whole remaines) by 7 (your roote found), ſo haue you 42 for the numerator to 104, which $\frac{42}{104}$ being abbreuiated, giueth $\frac{21}{52}$ for your ſecond fraction: now the meane proportion betwixt $\frac{3}{7}$ and $\frac{21}{52}$ being taken, as you are taught before, giueth $\frac{303}{728}$ for the fraction to bee ioyned with your roote found, approouing that $7\frac{303}{728}$ is the neereſt ſquare roote of 55; which multiplied into it ſelfe ſquarely, produceth $55\frac{81}{529984}$, which is about the 6543 part of a vnitie, different from the firſt giuen number: and thus haue I performed my promiſe, in giuing you diuerſitie of rules, with diuers examples, whereby you may with eaſe and certaintie take the neereſt ſquare roote of any number whatſoeuer. And this Rule, with all the parts of it, I thinke I may be bold to call mine owne: for (as yet) I neuer read it in any Author, nor was euer ſhowne it by any Artiſt; and were it not mine owne, I ſhould then commend it farther, then modeſtie will now permit me; therefore I leaue it to the cenſure of the iudicious vnderſtander, wiſhing as much continuall profit to the practiſer, as I had ſtudie, pleaſure and contentment in the finding of it. And ſo I conclude the extraction of the ſquare roote in whole numbers.

When any fraction is giuen to haue the ſquare roote extracted, you muſt take the ſquare roote of the numerator, and thereof make a new numerator, and likewiſe the ſquare roote of the denominator, and thereof make a new denominator, and this latter fraction ſhall be the roote of the former: as if $\frac{9}{16}$ were the giuen number, the roote of 9 is 3, and the roote of 16 is 4, ſo haue you $\frac{3}{4}$ for the roote of $\frac{9}{16}$. Againe, in $\frac{25}{49}$ the roote of 25 is 5, and the roote of 49 is 7; ſo that $\frac{5}{7}$ is the ſquare root of $\frac{25}{49}$, and thus of all other ſquare fractions whatſoeuer.

The vſes of the ſquare roote are infinit, as is (or ſhould bee) well

well knowne to all Generalls of Armies, Sargeant Maiors, Colonels, Captaines, and all worthie Souldiers whatsoeuer. Likewise to all Surueiours, Astronomers, Nauigators, Timber-Measurers, and all the worthie Students of the noble Sciences Mathematicall in generall, which for that their seuerall writings doe diuersly shew the necessarie vses of extracting the square root, let it suffise, that I haue showne you how to extract it.

The extraction of the Cubique Roote.

AS the square roote is any digit, or other number, which being multiplied into it selfe produceth a right square superficiall number, hauing onely length and breadth: so the Cubique roote is any digit or other number, which being multiplied into it selfe, and the product again by the first multiplier, produceth a right Cubique number, hauing length breadth and thickneſſe, as 2 multiplied by 2 maketh 4, and 4 againe by 2 produceth 8, a right Cubique number; whereof 2 is the Cube roote. Likewise 3 multiplied by 3, produceth 9, and 9 againe by 3 produceth 27, a right Cubique number, whereof 3 is the Cube roote; and thus of all the digits or other numbers whatsoeuer. Now as in the extraction of the square roote, it is necessarie to know the square numbers of all the digits; so in the extraction of the Cubique roote, it behoueth you to know and remember, both the Square and Cubique numbers of all the digits, or (at the least) to haue alwaies before you (as a helpe to memory) in your working, a Table of this forme, wherein both the rootes, Squares and Cubiques of all the digits, are (as you see) placed in order. This Table either remembred, or thus placed before you, to take the Cubique roote of any number by our Table: obserue this briefe instruction.

Rootes.	*Squares.*	*Cubiques.*
1	1	1
2	4	8
3	9	27
4	16	64
5	25	125
6	36	216
7	49	343
8	64	512
9	81	729

Set the giuen number in the firſt row of your table, & the root or quotient (as it riſeth) in the place of pence; then in the ſecond row begin at the place of vnities, and there open 1, and leauing 2 places betweene, at the fourth place open another vnitie: againe, leauing 2 places between, at the ſeuenth place open another vnitie; and ſo forward, as many as the giuen number will beare, with 2 places left betweene. And note, that as many vnities as you haue thus opened, of ſo many figures wil conſiſt the Cube root of that number. As if it beare but 2, the root wil conſiſt of 2 figures; if 3, of 3 figures; if 4, of 4, and ſo forth, how many ſoeuer. Then to finde the roote, note the number aboue the laſt place or pricke, and out of that figure or figures, take the greateſt Cube-number therein contained, the roote of which number ſhall be the firſt figure in your quotient; which roote found and ſet in quotient, ſet it againe in the ſecond row of your Table, a place lower then where you made your former ſubtraction; and there triple it, that is, multiplie it by 3, that triple ſet againe in the third row of your Table, a place beneath your former triple; then multiplie the firſt triple by the roote found, and that product ſhall bee your diuiſor: therefore examine how often your diuiſor may bee taken out of your diuidend, prouided alwaies that you leaue a competent number for the multiplications of the other triple, and the roote to bee found. Now when you haue found, how often your diuiſor may bee taken, that number ſhall bee the ſecond figure in your roote: for you muſt know, that you may not exceede 9, therefore when you haue placed the ſecond figure in your roote, by that figure multiplie your diuiſor in the ſecond row; by the ſquare of that figure, multiplie the triple in the third row; and ſet the Cube of that figure in the fourth row, a place beneath the ſquared triple in the third row: this done, adde all the numbers of the ſecond, third and fourth rowes together, and ſubtract that totall from the diuidend in the firſt row, and thus haue you wrought for your ſecond figure. If there bee yet more, place your whole quotient or roote in the ſecond row of your Table, ſo that the laſt figure of your roote found, may ſtand a place lower then you yet vſed, and there triple as before, ſet that triple lower in the third row as before, and proceede

ceed as before in all. All which you ſhall plainely perceiue by two or 3 plaine and eaſie examples.

Let 32768 be the number, of which you deſire the Cubique roote; ſet the giuen number in the firſt row of your Table, as in this example. Then in the ſecond row open an vnitie in the firſt place, and another in the fourth place, as you ſee repreſented in the example by two pricks. This done, take the greateſt Cube number in 32 (which is 27) from 32 (the nũber ouer your laſt pricke), ſo remaineth 5, the roote of which 27 is 3, that 3 ſet in the ſecond place of pence, as you ſee in the example; then triple that 3, making it 9, a place beneath your laſt prick, and ſet that triple 9 in the third row, a place lower then your former triple: this done, multiplie 9 (your firſt triple) by 3 (your roote found) and the product 27 is your diuiſor; therefore examine how many times 2 (the firſt figure of your diuiſor) is in 5, the figure ouer it, and you will finde it 2 times in 5; or examine, how many times 27 (your whole diuiſor) is in 57, the number ouer it, and you likewiſe haue it two times, therefore ſet 2 for the next figure of your roote, as in the example; by which 2 multiplie 27 (your diuiſor) in the ſecond row by the ſquare of that 2 (which is 4), multiplie 9 (your triple) in the third row, and the Cube of 2 (which is 8) ſet in your fourth row, a place beneath your triple in the third row, ſo haue you 5400 in the ſecond row, 360 in the third row, and 8 in the fourth row, all which added together, maketh 5768, to bee ſubtracted from 5768, and there remaines 0; whereby appeareth, that 32768 is a right Cubique number, whereof 32 is the Cuberoote.

m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
						5					
					3	2	7	6	8		
							9				
						2	7				
						5	4				
								9			
						2	3	6			
									8		3
						5	7	6	8		2

Againe, let 268336125 be the number, of which you desire the Cubique roote: place your giuen number in the first row of your Table, thus.

m.	c.	x.	m.	c.	x.	m.	c.	x.	m.	c.	x.	l.
			6									
		5	2	1	9	2						
	2	6	8	3	3	6	1	2	5			
		1			8	6						6
		1	6		8	6						
		4	3	2	0	0						4
					8	6						
			2	8	8	0						5
					6	4						
		4	6	1	4	4						
					1	9	2					
						1	9	2				

Then open an vnitie in the first, fourth, and seuenth places, as in the example; this done, take the greatest Cube number in 268 (the number aboue your last prick) from 268, to which Cube number is 216, and taken from 268, leaueth 52. 336 (for the nexte number aboue the second prick) and giueth 6 for the Cubique roote of 216, set in the third place of pence, as you see in the example: this done, triple 6 (your roote found) in the second row of your Table, a place beneath your last prick, and set the summe 18 in the third row, a place beneath the former triple, so haue you 1800 in the second row, and 180 in the third row for the numbers aboue your second pricke; then multiplie 1800 (your first triple) by 6 (the roote found), and the product is 10800 for your diuisor: this done, examine how many times 1, the first figure of your diuisor may be taken from 5 the number ouer it, where you may take it 5 times, but then will not the remaines beare the succeeding multiplications; therefore allow it but 4 times, & for 4 in your quotient for the second figure of your roote: by which 4 multiply 10800 (your diuisor) so haue you 43200 in the second row, by the square of that 4 (which is 16) multiplie

180 (your ſecond triple) ſo haue you 2880 in the third row, and ſet the Cube of 4 (being 64) in the fourth row; theſe three, that is, 43200 2880 and 64 added together, make 46144, and being ſubtracted from 52336 (the number ouer the ſecond pricke), leaueth remaining 6192125 for the number ouer the third and laſt prick, and thus haue you 6 and 4 for the firſt and ſecond figures of your roote. Now to proceede, take the ſame 64 (your roote found) and place it ſo in the ſecond row of your Table, that the laſt figure 4 may ſtand a place beneath your ſecond prick, ſo will it be 6400, and there triple it, ſo haue you 19200 for your firſt triple; then ſet the ſame againe a place lower in the third row, ſo haue you 1920 for your ſecond triple; this done, multiplie 19200 in the ſecond row by 64 (your whole roote found), and the product will bee 1228800 for your diuiſor, therfore examine how many times 1 (the firſt figure of your diuiſor) may bee taken from 6 (the number ouer it), where you may haue it 6 times, but then you will want for your following operations, therefore allow it but 5 times, and ſet 5 for the third figure in your roote, by which 5 multiplie 1228800 (your diuiſor), ſo haue you 6144000 in the ſecond row; by the ſquare of that 5 (being 25) multiplie 1920 (your ſecond triple), ſo haue you 48000 in the third row: finally, ſet the Cube of 5 (which is 125) in the fourth row, and then haue you 6144000 48000, and 125 for your addition, which being added together, maketh 6192125, equall to your former remaines, approouing that 268336125 is a direct Cubique number, whereof 645 is the Cube roote. And thus haue you two examples ſufficient for your inſtruction, in taking the Cube roote of any number whatſoeuer, only it reſteth that I giue you one example with Cyphers interpoſed, of which take this next queſtion for your example.

Let 272165765 12 bee the number, of which I deſire the Cubique roote, I ſet the giuen number in the firſt row of my Table, and in the firſt, fourth, ſeuenth, and tenth places of the ſecond row I open vnities, leauing two places betweene each vnitie, as in this example following; whereby I know, that my roote will conſiſt of 4 figures; therefore to find the firſt figure of my roote, I cancell the greateſt Cube number ouer my laſt

place

place or pricke,	x.	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
which	8	7	2	1	6	5	7	6	5	1	2		3
number is													
27, and			9										
taken													
from 27		2	7										
remaineth													
0. Now			2	7									0
the Cube													
roote of				2	7								
27 is 3,													
which 3			2	1	6								
I set in the													
first place				9									0
of pence						9							
for the									9				
first figure													
of my						5	7	6					8
roote,									5	1	2		
then I tri-													

ple 3 (my roote found) a place beneath my last pricke, and I set that triple againe a place lower, as in the example: this done, I multiplie the first triple 9 by 3 (my roote found) making 27 for my diuisor; then I examine my numbers, and finde that I cannot haue 27 in 2, the number ouer it, I therefore set 27 (my diuisor) a place lower, and allow a Cypher in the second place of my roote; and because I haue remoued my diuisor one place lower, I remoue my triple in the third row two places lower: for you must obserue, that for euery Cypher that commeth betweene the figures in your roote, you must likewise leaue a Cypher betweene your diuisor and your triple, as you see I haue done in the second worke of the example: now finding againe that I cannot haue 27 (my diuisor) in 21 (the number now come to be ouer it) I yet againe remoue my diuisor one place lower, allowing another Cypher in the next place of my roote; And (for the former reason) I remoue my triple in the third row two places lower as before, all which you may perceiue by

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the third worke in the example: now hauing by this meanes brought 27 (my diuiſor) to ſtand vnder a number greater then it ſelfe, I examine how many times 27 may be found in 216, (the number now come to bee ouer it) and I finde it 8 times; I therefore ſet 8 in the fourth place for the laſt figure of my roote, by which 8 I multiplie 27 (my diuiſor) in the ſecond row, ſo haue I 216 in the ſecond row, equall to the number aboue my third prick; by the ſquare of that 8 (being 64) I multiplie 9, (my triple) in the third row, ſo haue I 576, equall to the number aboue the ſecond prick; and the Cube of that 8, being 512 I ſet in the fourth row, which is equal to the number aboue my firſt pricke; theſe three numbers, that is, 216, 576 512, being orderly added together, as they ſtand in your Table, produce 216576512, equall to your whole remaines; whereby is proued, that 272165765 12 is a right Cubique number, whereof 3008 is the Cube roote; which 3008 multiplied into it ſelfe Cubically produceth the firſt giuen number: and thus are you (I hope) fully inſtructed for taking the Cubique roote of any number whatſoeuer.

When any ſurd number is giuen to haue the Cubique roote extracted, there is no better way to come by the neereſt roote, then by adding to the giuen number 3, 6 9, or more Cyphers at your pleaſure, and ſo to take the roote downeward, as farre as it may be taken. And in the concluſion, for euery three Cyphers thus added, to cut off one figure from the roote; and of thoſe figures ſo cut off, to make a numerator to an vnitie in a higher place; now the adding of Cyphers by our Table is none other, then ſetting the giuen number ſo many places higher, as in this example.

Let 75 be the number, of which I deſire the neereſt Cubique roote, I ſet 75 in the	x.	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	ſ.	d.
	1	1			8	7	1	3	6	8	7		
	7	5	0	0	0	0	0	0	0	0	0		4
													2
								4					
									2	1	7		1
								1	0	0	0		
													7

firſt row of my Table 9 places higher, as in this example following: then I take the greateſt Cube roote, as I haue taught before, and find it to be 4217, of which (becauſe I added nine Cyphers) I cut off the firſt three figures, making them the numerator to an vnity in an higher place, ſo haue I $4\frac{217}{1000}$ for the neereſt Cube roote of 75, and thus may you doe with any ſurd number whatſoeuer.

Or if you pleaſe thus; ſet 75 (your giuen number) in the firſt row of your Table in it owne place, as in this example, and take from it 64 (the greateſt Cube number contained in it) ſo haue you 4 for your roote, and 11 remaining, that 11 ſet 3 places higher, making it 11000: then in the third place (that is in the place of hundreds triple 4 (the roote found) and ſet that triple lower in the third row, and proceede as before, ſo ſhall you finde 2 for the ſecond figure of your roote, with which 2 proceeding as in the the former extractions, you will finde 9600 in your ſecond row, 480 in your third row, and 8 in your fourth row; theſe added together, maketh 10088, which taken from 11000, remaineth 912, and thus haue you $\frac{2}{10}$ parts more of your roote. Againe, remoue 912 (your remaines) three places higher, making it 912000; and then in the third place (as before) triple 42 (your whole roote found) and proceede with that triple as with

	m.	c.	x.	m.	c.	x.	m.	c.	x.	li.	s.	d.
1									7	5		
									1	1		
						1	1	0	0	0		
						1	0	0	8	8		
									9	1	2	
2					9	1	2	0	0	0		
					5	3	0	4	6	1		
					3	8	1	5	3	9		
3		3	8	1	5	3	9	0	0	0		
		3	7	2	8	2	5	3	1	3		
		0	0	8	7	1	3	6	8	7		

with the former; ſo haue you 529200 for your diuiſor, and 1260 for your ſecond triple. Now 529200 can be but once taken from 912000, therefore 1 is the third figure of your roote, which 1 neither multiplieth nor diuideth, ſo your diuiſor ſtandeth vnaltered; likewiſe the ſquare and Cube of 1, is 1, for which reaſon you muſt onely adde 529200, 1260, and 1 (for the Cube of 1) together, and they make 530461, to bee ſubtracted from 912000, remaineth 381539, and thus haue you $\frac{21}{100}$ parts more of your roote. Yet againe, remoue your remaines three places higher, making them 381539000, and place the firſt figure of 421 (the roote found) in the place of hundreds as before, and there triple it, ſet that triple a place lower in the third row; then multiplie the firſt triple by 421 (the whole roote found) ſo haue you 53172300 for your diuiſor, which may be found 7 times in your diuidend; therefore ſet 7 for the fourth figure of your roote, and with that 7 proceede as I haue taught you in all the queſtions aforegoing, ſo ſhall you haue 372206100 in the ſecond row, 618870 in the third row, and 343 in the fourth row, which 3 added together, maketh 372825313, to be ſubtracted frō 381539000 (your former remaines) and leaueth ſtil remaining 8713687, as in the former work, where you added all your Cyphers firſt, and then took the root as far downeward as you could take it: thus haue you two waies in one nature, whereof you may chooſe which ſeemes beſt vnto you. But in mine opinion this latter is the better, eſpecially when you are to take the roote of any great number; and better waies then theſe are not knowne to me, for taking the neereſt Cube roote of any ſurd number whatſoeuer.

When any fraction is giuen to haue the Cube roote extracted, you muſt (as in the ſquare roote) onely take the Cube roote of the numerator, and thereof make a new numerator, and likewiſe take the Cube roote of the denominator, and thereof make a new denominator; as if you would take the Cube roote of $\frac{8}{27}$, the Cube of 8 is 2, and the Cube of 27 is 3, ſo the root of $\frac{8}{27}$ is $\frac{2}{3}$. Againe, if you would take the Cube roote of $\frac{64}{125}$, the Cube of 64 is 4, and the Cube of 125 is 5; ſo the roote of $\frac{64}{125}$ is $\frac{4}{5}$, and thus of all other fractions whatſoeuer.

And now am I come to the vttermoſt extent of thoſe limits, which I pretended to handle when I began this worke, being onely Arithmeticall: concerning Geometricall operations, as Land-meaſure, Timber-meaſure, or the like, although I might ſhew you ſom few examples, to manifeſt that the Table is capable of them all; yet my ſelfe being onely a true louer, but a ſmall practiſer of thoſe operations, I thought good to forbeare it, til God ſhould better enable me. Which when it pleaſeth him, I ſhall willingly make ſome ſmall addition for your ſatisfaction in that behalf: in the meane ſpace, accept of this worke for my good will; and ſo I bid you hartily farewell.

FINIS.

A Table of all the Rules contained in the three parts of this Booke, all which are wrought by that Table, whoſe type or figure ſtandeth in the title page.

The firſt Rule treateth of Numeration. 1
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The tenth Rule ſheweth the Double Rule of 3 in fractions. 71
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In all which Rules both of the firſt, ſecond and third Bookes, you may find ſufficient variety of queſtions and their workings, both for your inſtruction and ſatisfaction.

FINIS.

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